Goal (Lemma 2.11): to verify that Z7(z2,t)=-1

It is obvious(verified) that z2=-sqrt(z2s)∈(-1,1)

General remarks.

We will verify the equality in an equivalent form, namely that

(1+b0+b2z2^2+b4 z2^4+b6 2z^6)=-(b1z+b3z^3+b5z^5+b7 z^7).

We do not claim that this is the simplest way.

We give a particular example first (assuming that z2s, b0,...ω, etc are defined in terms of t)

In[ ]:= $\omega = \sqrt{\frac{4 - 11\,t + 8\,t^2}{t}}$;

In[ ]:=
```
z2s =
 (-6 + 25 t + 14 t^2 - 266 t^3 + 648 t^4 - 752 t^5 + 464 t^6 - 144 t^7 + 16 t^8 + (-1 + 2 t) ωω (2 - 3 t - 8 t^2 + 20
      t^3 - 14 t^4 + 4 t^5 + Sqrt[2] Sqrt[(t (10 - 41 t - 48 t^2 + 590 t^3 - 1482 t^4 + 1870 t^5 - 1328 t^6 +
             526 t^7 - 104 t^8 + 8 t^9 + t (19 - 124 t + 322 t^2 - 422 t^3 + 292 t^4 - 100 t^5 + 12 t^6)
              ωω))])) / (16 (-1 + t)^3 t^2 (-1 + 5 t - 6 t^2 + t^3))
```

Out[ ]=
```
(-6 + 25 t + 14 t^2 - 266 t^3 + 648 t^4 - 752 t^5 +
    464 t^6 - 144 t^7 + 16 t^8 + (-1 + 2 t) ωω (2 - 3 t - 8 t^2 + 20 t^3 - 14 t^4 + 4 t^5 +
       Sqrt[2] Sqrt[(t (10 - 41 t - 48 t^2 + 590 t^3 - 1482 t^4 + 1870 t^5 - 1328 t^6 + 526 t^7 -
             104 t^8 + 8 t^9 + t (19 - 124 t + 322 t^2 - 422 t^3 + 292 t^4 - 100 t^5 + 12 t^6)
              ωω))])) / (16 (-1 + t)^3 t^2 (-1 + 5 t - 6 t^2 + t^3))
```

In[ ]:=
```
q = (2 t - 1) ^ 10;
```

```
p61 = 16 t ^ 5 (-10 + 27 t + 288 t^2 - 2022 t^3 +
     5825 t^4 - 9477 t^5 + 9336 t^6 - 5494 t^7 + 1712 t^8 - 122 t^9 - 80 t^10 + 16 t^11);
p62 = (-16 t ^ 6) (-25 + 206 t - 726 t^2 + 1459 t^3 - 1927 t^4 + 1870 t^5 - 1394 t^6 + 724 t^7 - 210 t^8 + 24 t^9);
p41 = (-4 t ^ 3) (50 - 687 t + 4203 t^2 - 15 695 t^3 + 41 282 t^4 - 82 204 t^5 + 125 852 t^6 -
     144 150 t^7 + 117 216 t^8 - 62 520 t^9 + 18 496 t^10 - 1080 t^11 - 960 t^12 + 192 t^13);
p42 = 4 t ^ 3 (10 - 121 t + 677 t^2 - 2521 t^3 + 7132 t^4 - 15 412 t^5 + 24 800 t^6 -
     29 742 t^7 + 27 184 t^8 - 18 840 t^9 + 9072 t^10 - 2520 t^11 + 288 t^12);
p21 = (-2 + 40 t - 360 t^2 + 2245 t^3 - 11 098 t^4 + 42 924 t^5 - 126 314 t^6 + 282 304 t^7 - 483 968 t^8 +
    638 896 t^9 - 640 864 t^10 + 470 400 t^11 - 234 144 t^12 + 65 792 t^13 - 2784 t^14 - 3840 t^15 + 768 t^16);
p22 = -t ^ 3 (65 - 774 t + 4344 t^2 - 15 694 t^3 + 41 224 t^4 - 82 096 t^5 + 124 784 t^6 -
     144 768 t^7 + 127 840 t^8 - 83 808 t^9 + 37 824 t^10 - 10 080 t^11 + 1152 t^12);
p01 = (1 - t) (1 - 19 t + 161 t^2 - 924 t^3 + 4066 t^4 - 13 822 t^5 + 35 840 t^6 - 70 584 t^7 + 105 400 t^8 -
```

$$118\,168\,t^{9}+96\,704\,t^{10}-54\,208\,t^{11}+17\,760\,t^{12}-1440\,t^{13}-1024\,t^{14}+256\,t^{15});$$

$$\mathrm{p02}=t^{3}\,(25-290\,t+1636\,t^{2}-6010\,t^{3}+15\,992\,t^{4}-32\,064\,t^{5}+48\,928\,t^{6}-56\,632\,t^{7}+49\,024\,t^{8}-30\,752\,t^{9}+13\,120\,t^{10}-3360\,t^{11}+384\,t^{12});$$

$$\mathrm{p11}=8\,t\,{}^\wedge 3\,(t-1)\,(-125+4005\,t-60\,169\,t^{2}+570\,158\,t^{3}-3\,862\,166\,t^{4}+20\,045\,945\,t^{5}-83\,223\,823\,t^{6}+284\,217\,439\,t^{7}-813\,613\,881\,t^{8}+1\,978\,202\,656\,t^{9}-4\,124\,892\,528\,t^{10}+7\,432\,364\,016\,t^{11}-11\,645\,707\,296\,t^{12}+15\,960\,414\,880\,t^{13}-19\,242\,695\,952\,t^{14}+20\,530\,254\,512\,t^{15}-19\,487\,643\,408\,t^{16}+16\,504\,985\,216\,t^{17}-12\,441\,863\,808\,t^{18}+8\,263\,236\,224\,t^{19}-4\,749\,495\,424\,t^{20}+2\,309\,017\,088\,t^{21}-926\,839\,040\,t^{22}+300\,215\,040\,t^{23}-76\,503\,296\,t^{24}+14\,585\,856\,t^{25}-1\,794\,048\,t^{26}+73\,728\,t^{27}+8192\,t^{28});$$

$$\mathrm{p12}=8\,t\,{}^\wedge 3\,(1-t)\,(-25+765\,t-11\,171\,t^{2}+105\,634\,t^{3}-736\,638\,t^{4}+4\,055\,851\,t^{5}-18\,297\,419\,t^{6}+69\,029\,409\,t^{7}-220\,386\,161\,t^{8}+599\,953\,820\,t^{9}-1\,399\,432\,680\,t^{10}+2\,804\,818\,368\,t^{11}-4\,835\,265\,904\,t^{12}+7\,165\,985\,152\,t^{13}-9\,113\,381\,872\,t^{14}+9\,916\,520\,688\,t^{15}-9\,197\,207\,856\,t^{16}+7\,238\,388\,416\,t^{17}-4\,811\,313\,152\,t^{18}+2\,688\,147\,584\,t^{19}-1\,256\,283\,520\,t^{20}+488\,377\,856\,t^{21}-156\,990\,208\,t^{22}+41\,689\,856\,t^{23}-9\,309\,952\,t^{24}+1\,799\,168\,t^{25}-280\,576\,t^{26}+24\,576\,t^{27});$$

$$\mathrm{p31}=8\,t\,{}^\wedge 3\,(t-1)\,(-125+4005\,t-59\,369\,t^{2}+553\,998\,t^{3}-3\,730\,470\,t^{4}+19\,565\,545\,t^{5}-83\,537\,119\,t^{6}+297\,885\,767\,t^{7}-901\,975\,729\,t^{8}+2\,350\,136\,384\,t^{9}-5\,333\,296\,784\,t^{10}+10\,652\,922\,784\,t^{11}-18\,880\,321\,184\,t^{12}+29\,852\,879\,392\,t^{13}-42\,255\,474\,560\,t^{14}+53\,630\,116\,864\,t^{15}-60\,971\,031\,168\,t^{16}+61\,759\,492\,352\,t^{17}-55\,128\,623\,872\,t^{18}+42\,657\,332\,224\,t^{19}-28\,037\,451\,008\,t^{20}+15\,314\,942\,464\,t^{21}-6\,803\,466\,496\,t^{22}+2\,405\,327\,616\,t^{23}-657\,957\,120\,t^{24}+131\,469\,312\,t^{25}-16\,441\,344\,t^{26}+663\,552\,t^{27}+73\,728\,t^{28});$$

$$\mathrm{p32}=8\,t\,{}^\wedge 3\,(1-t)\,(-25+765\,t-11\,171\,t^{2}+107\,634\,t^{3}-787\,518\,t^{4}+4\,665\,067\,t^{5}-22\,973\,819\,t^{6}+95\,297\,577\,t^{7}-336\,259\,225\,t^{8}+1\,016\,942\,748\,t^{9}-2\,647\,457\,192\,t^{10}+5\,940\,364\,352\,t^{11}-11\,479\,425\,312\,t^{12}+19\,070\,848\,736\,t^{13}-27\,171\,006\,848\,t^{14}+33\,097\,766\,976\,t^{15}-34\,341\,234\,112\,t^{16}+30\,212\,895\,232\,t^{17}-22\,415\,990\,528\,t^{18}+13\,930\,544\,128\,t^{19}-7\,190\,272\,256\,t^{20}+3\,053\,491\,200\,t^{21}-1\,060\,255\,488\,t^{22}+303\,176\,448\,t^{23}-73\,578\,240\,t^{24}+15\,455\,232\,t^{25}-2\,525\,184\,t^{26}+221\,184\,t^{27});$$

$$\mathrm{p51}=128\,t\,{}^\wedge 8\,(t-1)\,(-1500+28\,960\,t-257\,939\,t^{2}+1\,404\,604\,t^{3}-5\,211\,955\,t^{4}+13\,795\,890\,t^{5}-25\,855\,137\,t^{6}+29\,614\,248\,t^{7}+3\,063\,112\,t^{8}-113\,012\,293\,t^{9}+333\,031\,055\,t^{10}-652\,968\,101\,t^{11}+993\,241\,608\,t^{12}-1\,221\,269\,400\,t^{13}+1\,224\,164\,696\,t^{14}-994\,694\,744\,t^{15}+647\,101\,024\,t^{16}-331\,790\,224\,t^{17}+131\,533\,872\,t^{18}-39\,147\,024\,t^{19}+8\,229\,120\,t^{20}-1\,046\,016\,t^{21}+41\,472\,t^{22}+4608\,t^{23});$$

$$\mathrm{p52}=128\,t\,{}^\wedge 8\,(1-t)\,(-100+80\,t+20\,039\,t^{2}-260\,728\,t^{3}+1\,786\,957\,t^{4}-8\,269\,540\,t^{5}+28\,531\,279\,t^{6}-77\,414\,974\,t^{7}+170\,435\,054\,t^{8}-309\,998\,835\,t^{9}+470\,441\,223\,t^{10}-598\,385\,907\,t^{11}+638\,090\,092\,t^{12}-567\,729\,488\,t^{13}+417\,123\,064\,t^{14}-249\,429\,768\,t^{15}+119\,783\,328\,t^{16}-46\,124\,976\,t^{17}+14\,587\,824\,t^{18}-3\,960\,432\,t^{19}+919\,872\,t^{20}-157\,824\,t^{21}+13\,824\,t^{22});$$

$$\mathrm{p71}=2048\,t\,{}^\wedge 13\,(t-1)\,(-25+56\,t+2520\,t^{2}-25\,565\,t^{3}+120\,032\,t^{4}-330\,197\,t^{5}+533\,239\,t^{6}-339\,915\,t^{7}-575\,358\,t^{8}+1\,899\,107\,t^{9}-2\,748\,394\,t^{10}+2\,566\,194\,t^{11}-1\,675\,233\,t^{12}+781\,067\,t^{13}-257\,689\,t^{14}+57\,232\,t^{15}-7392\,t^{16}+288\,t^{17}+32\,t^{18});$$

$$\mathrm{p72}=2048\,t\,{}^\wedge 13\,(1-t)\,(-1-50\,t+626\,t^{2}-2319\,t^{3}-1948\,t^{4}+47\,711\,t^{5}-201\,331\,t^{6}+485\,563\,t^{7}-779\,658\,t^{8}+878\,711\,t^{9}-712\,736\,t^{10}+425\,072\,t^{11}-193\,639\,t^{12}+72\,003\,t^{13}-23\,071\,t^{14}+6068\,t^{15}-1096\,t^{16}+96\,t^{17});$$

In[ ]:=
```
RootReduce[
  1 / q {Sqrt[p71 + p72 ωω], p61 + p62 ωω, -Sqrt[p51 + p52 ωω], p41 + p42 ωω, Sqrt[p31 + p32 ωω],
      p21 + p22 ωω, -Sqrt[p11 + p12 ωω], p01 + p02 ωω}.
     Table[(-Sqrt[z2s])^j, {j, 7, 0, -1}] /. ωω → ω /. {t → 4 / 5}]
```

Out[ ]= -1

In[ ]:=
```
{RootReduce[
   1 / q (q + {p61 + p62 ωω, p41 + p42 ωω, p21 + p22 ωω, p01 + p02 ωω}.Table[(-Sqrt[z2s])^j,
          {j, 6, 0, -2}]) /. ωω → ω /. {t → 4 / 5}], RootReduce[
   1 / q {-Sqrt[p71 + p72 ωω], Sqrt[p51 + p52 ωω], -Sqrt[p31 + p32 ωω], Sqrt[p11 + p12 ωω]}.
      Table[(-Sqrt[z2s])^j, {j, 7, 1, -2}] /. ωω → ω /. {t → 4 / 5}]}
```

Out[ ]= {0.720 …, 0.720 …}

Now we will show two canonical forms of the LHS and RHS

(a) with radicals

(b) as bivariate integral polynomial p(t,y) (labeled by qq45) whose zero set is a superset of the curve (t,LHS(t))=(t,RHS(t)) (t∈(t0,1))

In[ ]:=
```
qq45 = -4096 + 148 480 t - 2 750 720 t^2 + 34 749 824 t^3 - 336 526 192 t^4 + 2 659 653 476 t^5 -
    17 816 570 327 t^6 + 103 669 805 970 t^7 - 532 673 407 533 t^8 + 2 444 555 432 428 t^9 -
    10 101 516 992 278 t^10 + 37 808 103 046 200 t^11 - 128 736 341 031 482 t^12 +
    400 097 778 377 888 t^13 - 1 137 744 898 086 151 t^14 + 2 965 536 850 326 350 t^15 -
    7 093 301 577 214 869 t^16 + 15 579 473 043 083 968 t^17 - 31 424 558 991 009 676 t^18 +
    58 188 795 780 620 280 t^19 - 98 832 142 780 309 764 t^20 + 153 771 297 026 767 552 t^21 -
    218 772 834 488 230 896 t^22 + 283 964 518 819 782 336 t^23 - 335 334 923 634 828 768 t^24 +
    359 082 661 480 751 680 t^25 - 347 305 120 815 149 760 t^26 + 302 022 806 671 910 528 t^27 -
    234 884 594 325 708 288 t^28 + 162 340 823 171 777 024 t^29 - 98 977 513 449 947 392 t^30 +
    52 763 299 284 114 944 t^31 - 24 330 463 229 814 016 t^32 + 9 577 133 976 019 968 t^33 -
    3 164 554 413 297 664 t^34 + 858 818 914 918 400 t^35 - 185 838 351 155 200 t^36 +
    30 727 222 591 488 t^37 - 3 631 831 056 384 t^38 + 272 092 889 088 t^39 - 9 663 676 416 t^40 +
    (-512 t^3 + 36 480 t^4 - 862 368 t^5 + 10 578 472 t^6 - 71 258 236 t^7 + 129 341 869 t^8 +
       2 786 256 320 t^9 - 38 165 474 712 t^10 + 295 155 126 592 t^11 - 1 688 825 202 801 t^12 +
       7 745 491 543 804 t^13 - 29 539 529 842 228 t^14 + 95 567 084 428 168 t^15 -
       265 211 205 189 724 t^16 + 634 568 767 617 900 t^17 - 1 308 675 104 905 300 t^18 +
       2 309 673 007 928 456 t^19 - 3 422 964 145 264 132 t^20 + 4 063 930 244 975 440 t^21 -
       3 328 525 537 082 832 t^22 + 362 287 730 145 472 t^23 + 5 031 272 957 570 880 t^24 -
       11 916 590 513 322 944 t^25 + 18 346 637 582 050 816 t^26 - 22 202 048 974 222 720 t^27 +
       22 291 811 606 586 368 t^28 - 18 958 202 256 457 728 t^29 + 13 762 753 646 345 216 t^30 -
       8 537 042 285 750 272 t^31 + 4 508 930 756 182 016 t^32 - 2 012 599 688 642 560 t^33 +
       750 296 622 743 552 t^34 - 229 579 662 491 648 t^35 + 56 196 285 202 432 t^36 -
       10 581 868 544 000 t^37 + 1 438 010 834 944 t^38 - 125 275 471 872 t^39 + 5 234 491 392 t^40) y +
    (128 t^5 + 944 t^6 - 121 024 t^7 + 2 435 295 t^8 - 25 309 618 t^9 + 150 214 572 t^10 - 338 717 930 t^11 -
```

$2\,716\,061\,235\ t^{12} + 35\,586\,205\,432\ t^{13} - 228\,758\,901\,298\ t^{14} + 1\,038\,778\,158\,408\ t^{15} -$
$3\,641\,811\,626\,338\ t^{16} + 10\,209\,673\,867\,420\ t^{17} - 23\,229\,240\,646\,864\ t^{18} + 43\,067\,989\,979\,784$
$t^{19} - 64\,999\,863\,846\,764\ t^{20} + 80\,441\,318\,627\,968\ t^{21} - 87\,334\,674\,313\,120\ t^{22} +$
$105\,688\,325\,071\,488\ t^{23} - 180\,692\,976\,848\,352\ t^{24} + 356\,158\,390\,490\,240\ t^{25} -$
$627\,743\,179\,812\,288\ t^{26} + 917\,571\,987\,183\,616\ t^{27} - 1\,106\,630\,331\,519\,232\ t^{28} +$
$1\,109\,792\,927\,015\,936\ t^{29} - 931\,896\,661\,092\,352\ t^{30} + 657\,693\,440\,925\,696\ t^{31} -$
$390\,390\,706\,241\,536\ t^{32} + 194\,478\,675\,722\,240\ t^{33} - 80\,920\,576\,049\,152\ t^{34} +$
$27\,904\,990\,773\,248\ t^{35} - 7\,880\,314\,781\,696\ t^{36} + 1\,787\,806\,613\,504\ t^{37} -$
$315\,265\,908\,736\ t^{38} + 40\,653\,291\,520\ t^{39} - 3\,388\,997\,632\ t^{40} + 134\,217\,728\ t^{41})\ y^2 +$
$(8\ t^8 - 202\ t^9 - 273\ t^{10} + 87\,928\ t^{11} - 1\,942\,927\ t^{12} + 24\,965\,964\ t^{13} - 227\,100\,424\ t^{14} +$
$1\,579\,091\,256\ t^{15} - 8\,743\,747\,008\ t^{16} + 39\,530\,964\,420\ t^{17} - 148\,289\,139\,060\ t^{18} +$
$466\,280\,733\,784\ t^{19} - 1\,235\,973\,648\,972\ t^{20} + 2\,765\,663\,780\,976\ t^{21} - 5\,205\,285\,494\,432\ t^{22} +$
$8\,148\,562\,651\,392\ t^{23} - 10\,336\,766\,132\,480\ t^{24} + 9\,948\,814\,128\,128\ t^{25} -$
$5\,692\,194\,596\,864\ t^{26} - 1\,905\,393\,430\,528\ t^{27} + 10\,212\,250\,810\,368\ t^{28} -$
$15\,862\,040\,682\,496\ t^{29} + 16\,889\,421\,414\,400\ t^{30} - 13\,848\,250\,941\,440\ t^{31} +$
$9\,035\,515\,887\,616\ t^{32} - 4\,720\,780\,378\,112\ t^{33} + 1\,959\,608\,975\,360\ t^{34} - 633\,610\,960\,896\ t^{35} +$
$154\,131\,496\,960\ t^{36} - 26\,576\,158\,720\ t^{37} + 2\,900\,361\,216\ t^{38} - 150\,994\,944\ t^{39})\ y^3 +$
$(-t^{10} + 50\ t^{11} - 1203\ t^{12} + 18\,544\ t^{13} - 205\,715\ t^{14} + 1\,748\,874\ t^{15} - 11\,847\,485\ t^{16} +$
$65\,652\,532\ t^{17} - 303\,151\,596\ t^{18} + 1\,182\,149\,760\ t^{19} - 3\,931\,550\,832\ t^{20} + 11\,232\,064\,320\ t^{21} -$
$27\,706\,743\,616\ t^{22} + 59\,214\,199\,808\ t^{23} - 109\,855\,142\,400\ t^{24} + 177\,017\,808\,896\ t^{25} -$
$247\,564\,564\,480\ t^{26} + 299\,858\,362\,368\ t^{27} - 313\,427\,288\,064\ t^{28} + 281\,219\,727\,360\ t^{29} -$
$215\,000\,383\,488\ t^{30} + 138\,664\,345\,600\ t^{31} - 74\,425\,892\,864\ t^{32} + 32\,629\,850\,112\ t^{33} -$
$11\,380\,981\,760\ t^{34} + 3\,036\,676\,096\ t^{35} - 581\,959\,680\ t^{36} + 71\,303\,168\ t^{37} - 4\,194\,304\ t^{38})\ y^4;$

In[ ]:=

$$rp1 = 8 + 54\ t - 2385\ t^{2} + 21528\ t^{3} - 100271\ t^{4} + 284780\ t^{5} - 512936\ t^{6} + 546616\ t^{7} - 185728\ t^{8} - 398908\ t^{9} + 761100\ t^{10} - 684968\ t^{11} + 377396\ t^{12} - 129808\ t^{13} + 25824\ t^{14} - 2304\ t^{15};$$

$$rp2 = (16 - 8\ t - 1275\ t^{2} + 9302\ t^{3} - 31095\ t^{4} + 53980\ t^{5} - 28974\ t^{6} - 80664\ t^{7} + 217764\ t^{8} - 264956\ t^{9} + 189108\ t^{10} - 76880\ t^{11} + 11764\ t^{12} + 3552\ t^{13} - 1888\ t^{14} + 256\ t^{15});$$

$$rq = 4\ (-1 + t)^{6}\ t^{2}\ (-1 + 2\ t)^{6};$$

$$rp3 = 2\ (12960 - 292016\ t + 2854698\ t^{2} - 14792140\ t^{3} + 32588991\ t^{4} + 85143228\ t^{5} - 925203078\ t^{6} + 3299368184\ t^{7} - 4942483971\ t^{8} - 7668657248\ t^{9} + 62474910910\ t^{10} - 170963084656\ t^{11} + 246192050150\ t^{12} - 34672143568\ t^{13} - 789233922456\ t^{14} + 2311627705560\ t^{15} - 4090792828656\ t^{16} + 5282309403760\ t^{17} - 5223088300728\ t^{18} + 3967261586528\ t^{19} - 2228596974256\ t^{20} + 799166250432\ t^{21} - 35198764320\ t^{22} - 180928743808\ t^{23} + 144029257712\ t^{24} - 66339007104\ t^{25} + 20749249664\ t^{26} - 4414670336\ t^{27} + 584887296\ t^{28} - 34091008\ t^{29} - 1572864\ t^{30} + 262144\ t^{31});$$

$$rp4 = 2\ (6624\ t - 161376\ t^{2} + 1695878\ t^{3} - 9509785\ t^{4} + 24259520\ t^{5} + 42626172\ t^{6} - 628269302\ t^{7} + 2609963815\ t^{8} - 5418910112\ t^{9} + 384019718\ t^{10} + 38614387936\ t^{11} - 152399515228\ t^{12} + 362607645744\ t^{13} - 617651612344\ t^{14} + 779178270248\ t^{15} - 703631968400\ t^{16} + 373394610624\ t^{17} + 57362354376\ t^{18} - 372214821664\ t^{19} + 456997541776\ t^{20} - 358199885632\ t^{21} + 201881079680\ t^{22} - 82461667616\ t^{23} + 22845169104\ t^{24} - 3148220352\ t^{25} - 456967680\ t^{26} + 354630144\ t^{27} - 87122944\ t^{28} + 10960896\ t^{29} - 589824\ t^{30});$$

$$rqq = 4\ (-1 + t)^{6}\ t^{2}\ (-1 + 2\ t)^{6};$$

In[ ]:=

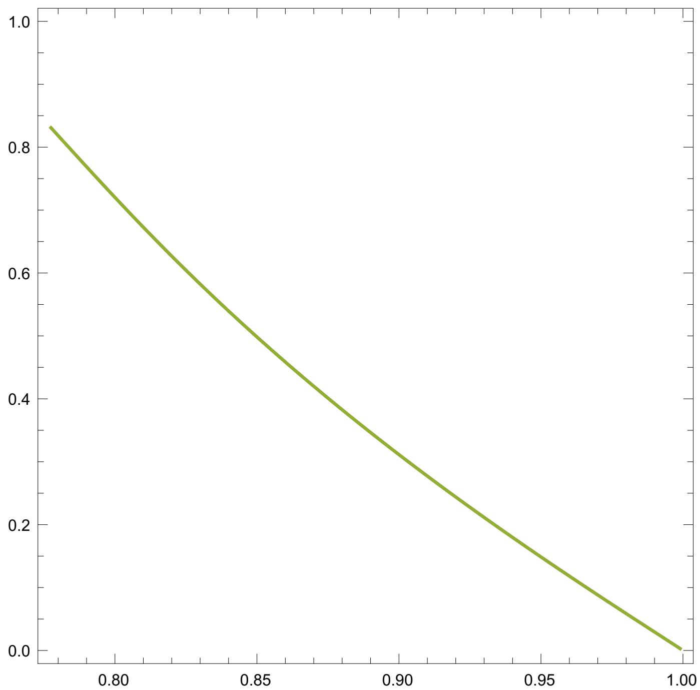
```
RootReduce[
 {Root[qq45 /. t → 4/5, 3], (rp1 + rp2 ωω - Sqrt[(rp3 + rp4 ωω)]) / rqq /. ωω → ω /. t → 4/5}]
```

Out[ ]= {0.720 …, 0.720 …}

the three expressions are the same (lhs, rhs, radical expression)

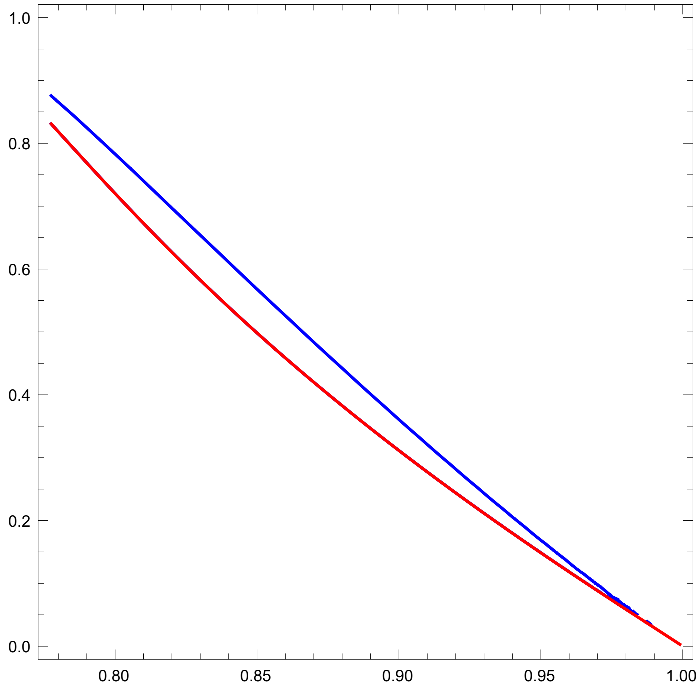
In[ ]:=
```
ContourPlot[
  Evaluate[{y == 1/q (q + {p61 + p62 ωω, p41 + p42 ωω, p21 + p22 ωω, p01 + p02 ωω}.Table[
          (-Sqrt[z2s])^j, {j, 6, 0, -2}]) /. ωω → ω,
     y == 1/q {-Sqrt[p71 + p72 ωω], Sqrt[p51 + p52 ωω], -Sqrt[p31 + p32 ωω],
          Sqrt[p11 + p12 ωω]}.Table[(-Sqrt[z2s])^j, {j, 7, 1, -2}] /. ωω → ω,
     y == (rp1 + rp2 ω - Sqrt[(rp3 + rp4 ω)]) / rqq}], {t, 0.777…, .999},
  {y, 0, 1}, WorkingPrecision → 80,
  PlotPoints → 80]
```

Out[ ]=



radical expression and the superset as a zeroset of a bivariate polynomial

In[ ]:=
```
ContourPlot[Evaluate[{qq45 == 0, y == (rp1 + rp2 ω - Sqrt[(rp3 + rp4 ω)]) / rqq}],
  {t, 0.777…, .999}, {y, 0, 1}, WorkingPrecision → 80,
  PlotPoints → 80, ContourStyle → {Blue, Red}]
```

Out[ ]=


Now the formal verification consist of showing that starting from the LHS/RHS we can derive the same radical expression/bivariate polynomial.
It seems that showing everything “on the polynomial” level turns out to be the standard way. If the LHS-RHS polynomials coincide, then one can show that zero set of qq45 consist of 4 separate continuous curves above (t0,1) and therefore testing one point (t=4/5) for identifying the radical expression (the 3rd curve part) is sufficient, QED.

To derive from LHS the radical expression, we take z2s = (z2)^2 as a sum.

z2s as z2s=z2ms+z2mms for the derivation (binomial theorem)

In[ ]:=
```
z2ms = (-6 + 25 t + 14 t^2 - 266 t^3 + 648 t^4 - 752 t^5 + 464 t^6 - 144 t^7 + 16 t^8 +
    (-1 + 2 t) ωω (2 - 3 t - 8 t^2 + 20 t^3 - 14 t^4 + 4 t^5 + 0)) / (16 (-1 + t)^3 t^2 (-1 + 5 t - 6 t^2 + t^3))
```

Out[ ]=
$$(-6 + 25\,t + 14\,t^2 - 266\,t^3 + 648\,t^4 - 752\,t^5 + 464\,t^6 - 144\,t^7 + 16\,t^8 + (-1 + 2\,t)\,(2 - 3\,t - 8\,t^2 + 20\,t^3 - 14\,t^4 + 4\,t^5)\,\omega\omega) \,/\, (16\,(-1 + t)^3\,t^2\,(-1 + 5\,t - 6\,t^2 + t^3))$$

In[ ]:=
```
z2mms =
 ((-1 + 2 t) ωω (Sqrt[2] Sqrt[(t (10 - 41 t - 48 t^2 + 590 t^3 - 1482 t^4 + 1870 t^5 - 1328 t^6 + 526 t^7 - 104 t^8 +
          8 t^9 + t (19 - 124 t + 322 t^2 - 422 t^3 + 292 t^4 - 100 t^5 + 12 t^6)
          ωω))])) / (16 (-1 + t)^3 t^2 (-1 + 5 t - 6 t^2 + t^3))
```

Out[ ]=
$$\Big((-1+2\,t)\,\omega\omega\,\sqrt{\big(t\,(10-41\,t-48\,t^2+590\,t^3-1482\,t^4+1870\,t^5-1328\,t^6+526\,t^7-104\,t^8+8\,t^9+t\,(19-124\,t+322\,t^2-422\,t^3+292\,t^4-100\,t^5+12\,t^6)\,\omega\omega)\big)}\Big)\Big/\Big(8\,\sqrt{2}\,(-1+t)^3\,t^2\,(-1+5\,t-6\,t^2+t^3)\Big)$$

In[ ]:=
```
Together[z2s - (z2ms + z2mms)]
```

Out[ ]= 0

In[ ]:=
```
Together[(rp1 + rp2 ωω) / rq - (1 + 1 / q {p61 + p62 ωω, p41 + p42 ωω, p21 + p22 ωω, p01 + p02 ωω}.
      {z2ms ^ 3 + 3 z2ms z2mms ^ 2, z2ms ^ 2 + z2mms ^ 2, z2ms, 1}) /. ωω → ω]
```

Out[ ]= 0

In[ ]:=
```
Together[(rp3 + rp4 ωω) / rq ^ 2 - (1 / q {p61 + p62 ωω, p41 + p42 ωω, p21 + p22 ωω, p01 + p02 ωω}.
      {z2mms ^ 2 z2mms + 3 z2ms ^ 2 z2mms, 2 z2ms z2mms, z2mms, 0}) ^ 2 /. ωω → ω]
```

Out[ ]= 0

The above computation verifies that LHS and the canonical radical expression are the same. One can also derive from the canonical radical expression the bivariate polynomial.

Now e.g. to derive from RHS the bivariate integral polynomial is a lengthy, tedious, resultant computa - tion (see below), but it works!

Auxiliary goal: rhs has the same bivariate polynomial as lhs above (qq45)

In[ ]:=
```
qq45 = -4096 + 148 480 t - 2 750 720 t^2 + 34 749 824 t^3 - 336 526 192 t^4 + 2 659 653 476 t^5 -
   17 816 570 327 t^6 + 103 669 805 970 t^7 - 532 673 407 533 t^8 + 2 444 555 432 428 t^9 -
   10 101 516 992 278 t^10 + 37 808 103 046 200 t^11 - 128 736 341 031 482 t^12 +
   400 097 778 377 888 t^13 - 1 137 744 898 086 151 t^14 + 2 965 536 850 326 350 t^15 -
   7 093 301 577 214 869 t^16 + 15 579 473 043 083 968 t^17 - 31 424 558 991 009 676 t^18 +
   58 188 795 780 620 280 t^19 - 98 832 142 780 309 764 t^20 + 153 771 297 026 767 552 t^21 -
   218 772 834 488 230 896 t^22 + 283 964 518 819 782 336 t^23 - 335 334 923 634 828 768 t^24 +
   359 082 661 480 751 680 t^25 - 347 305 120 815 149 760 t^26 + 302 022 806 671 910 528 t^27 -
   234 884 594 325 708 288 t^28 + 162 340 823 171 777 024 t^29 - 98 977 513 449 947 392 t^30 +
```

$$
\begin{aligned}
&52 763 299 284 114 944 \; t^{31} - 24 330 463 229 814 016 \; t^{32} + 9 577 133 976 019 968 \; t^{33} - \\
&3 164 554 413 297 664 \; t^{34} + 858 818 914 918 400 \; t^{35} - 185 838 351 155 200 \; t^{36} + \\
&30 727 222 591 488 \; t^{37} - 3 631 831 056 384 \; t^{38} + 272 092 889 088 \; t^{39} - 9 663 676 416 \; t^{40} + \\
&\big(-512 \; t^{3} + 36 480 \; t^{4} - 862 368 \; t^{5} + 10 578 472 \; t^{6} - 71 258 236 \; t^{7} + 129 341 869 \; t^{8} + \\
&\quad 2 786 256 320 \; t^{9} - 38 165 474 712 \; t^{10} + 295 155 126 592 \; t^{11} - 1 688 825 202 801 \; t^{12} + \\
&\quad 7 745 491 543 804 \; t^{13} - 29 539 529 842 228 \; t^{14} + 95 567 084 428 168 \; t^{15} - \\
&\quad 265 211 205 189 724 \; t^{16} + 634 568 767 617 900 \; t^{17} - 1 308 675 104 905 300 \; t^{18} + \\
&\quad 2 309 673 007 928 456 \; t^{19} - 3 422 964 145 264 132 \; t^{20} + 4 063 930 244 975 440 \; t^{21} - \\
&\quad 3 328 525 537 082 832 \; t^{22} + 362 287 730 145 472 \; t^{23} + 5 031 272 957 570 880 \; t^{24} - \\
&\quad 11 916 590 513 322 944 \; t^{25} + 18 346 637 582 050 816 \; t^{26} - 22 202 048 974 222 720 \; t^{27} + \\
&\quad 22 291 811 606 586 368 \; t^{28} - 18 958 202 256 457 728 \; t^{29} + 13 762 753 646 345 216 \; t^{30} - \\
&\quad 8 537 042 285 750 272 \; t^{31} + 4 508 930 756 182 016 \; t^{32} - 2 012 599 688 642 560 \; t^{33} + \\
&\quad 750 296 622 743 552 \; t^{34} - 229 579 662 491 648 \; t^{35} + 56 196 285 202 432 \; t^{36} - \\
&\quad 10 581 868 544 000 \; t^{37} + 1 438 010 834 944 \; t^{38} - 125 275 471 872 \; t^{39} + 5 234 491 392 \; t^{40}\big) \, y + \\
&\big(128 \; t^{5} + 944 \; t^{6} - 121 024 \; t^{7} + 2 435 295 \; t^{8} - 25 309 618 \; t^{9} + 150 214 572 \; t^{10} - 338 717 930 \; t^{11} - \\
&\quad 2 716 061 235 \; t^{12} + 35 586 205 432 \; t^{13} - 228 758 901 298 \; t^{14} + 1 038 778 158 408 \; t^{15} - \\
&\quad 3 641 811 626 338 \; t^{16} + 10 209 673 867 420 \; t^{17} - 23 229 240 646 864 \; t^{18} + 43 067 989 979 784 \\
&\quad t^{19} - 64 999 863 846 764 \; t^{20} + 80 441 318 627 968 \; t^{21} - 87 334 674 313 120 \; t^{22} + \\
&\quad 105 688 325 071 488 \; t^{23} - 180 692 976 848 352 \; t^{24} + 356 158 390 490 240 \; t^{25} - \\
&\quad 627 743 179 812 288 \; t^{26} + 917 571 987 183 616 \; t^{27} - 1 106 630 331 519 232 \; t^{28} + \\
&\quad 1 109 792 927 015 936 \; t^{29} - 931 896 661 092 352 \; t^{30} + 657 693 440 925 696 \; t^{31} - \\
&\quad 390 390 706 241 536 \; t^{32} + 194 478 675 722 240 \; t^{33} - 80 920 576 049 152 \; t^{34} + \\
&\quad 27 904 990 773 248 \; t^{35} - 7 880 314 781 696 \; t^{36} + 1 787 806 613 504 \; t^{37} - \\
&\quad 315 265 908 736 \; t^{38} + 40 653 291 520 \; t^{39} - 3 388 997 632 \; t^{40} + 134 217 728 \; t^{41}\big) \, y^{2} + \\
&\big(8 \; t^{8} - 202 \; t^{9} - 273 \; t^{10} + 87 928 \; t^{11} - 1 942 927 \; t^{12} + 24 965 964 \; t^{13} - 227 100 424 \; t^{14} + \\
&\quad 1 579 091 256 \; t^{15} - 8 743 747 008 \; t^{16} + 39 530 964 420 \; t^{17} - 148 289 139 060 \; t^{18} + \\
&\quad 466 280 733 784 \; t^{19} - 1 235 973 648 972 \; t^{20} + 2 765 663 780 976 \; t^{21} - 5 205 285 494 432 \; t^{22} + \\
&\quad 8 148 562 651 392 \; t^{23} - 10 336 766 132 480 \; t^{24} + 9 948 814 128 128 \; t^{25} - \\
&\quad 5 692 194 596 864 \; t^{26} - 1 905 393 430 528 \; t^{27} + 10 212 250 810 368 \; t^{28} - \\
&\quad 15 862 040 682 496 \; t^{29} + 16 889 421 414 400 \; t^{30} - 13 848 250 941 440 \; t^{31} + \\
&\quad 9 035 515 887 616 \; t^{32} - 4 720 780 378 112 \; t^{33} + 1 959 608 975 360 \; t^{34} - 633 610 960 896 \; t^{35} + \\
&\quad 154 131 496 960 \; t^{36} - 26 576 158 720 \; t^{37} + 2 900 361 216 \; t^{38} - 150 994 944 \; t^{39}\big) \, y^{3} + \\
&\big(-t^{10} + 50 \; t^{11} - 1203 \; t^{12} + 18 544 \; t^{13} - 205 715 \; t^{14} + 1 748 874 \; t^{15} - 11 847 485 \; t^{16} + \\
&\quad 65 652 532 \; t^{17} - 303 151 596 \; t^{18} + 1 182 149 760 \; t^{19} - 3 931 550 832 \; t^{20} + 11 232 064 320 \; t^{21} - \\
&\quad 27 706 743 616 \; t^{22} + 59 214 199 808 \; t^{23} - 109 855 142 400 \; t^{24} + 177 017 808 896 \; t^{25} - \\
&\quad 247 564 564 480 \; t^{26} + 299 858 362 368 \; t^{27} - 313 427 288 064 \; t^{28} + 281 219 727 360 \; t^{29} - \\
&\quad 215 000 383 488 \; t^{30} + 138 664 345 600 \; t^{31} - 74 425 892 864 \; t^{32} + 32 629 850 112 \; t^{33} - \\
&\quad 11 380 981 760 \; t^{34} + 3 036 676 096 \; t^{35} - 581 959 680 \; t^{36} + 71 303 168 \; t^{37} - 4 194 304 \; t^{38}\big) \, y^{4};
\end{aligned}
$$

particular check, then building up, step by step, the “radical/root“-tower

In[ ]:= Root[qq45 /. t → 4/5, 3]

Out[ ]= 0.720 …

In[ ]:= RootReduce[
1/q {-Sqrt[p71 + p72 ωω], Sqrt[p51 + p52 ωω], -Sqrt[p31 + p32 ωω], Sqrt[p11 + p12 ωω]}.
Table[(-Sqrt[Z])^j, {j, 7, 1, -2}] /. Z → z2s /. ωω → ω /. {{t → 4/5}}]

Out[ ]= {0.720 …}

In[ ]:= RootReduce[
1/q {0, 0, 0, Sqrt[p11 + p12 ωω]}.Table[(-Sqrt[Z])^j, {j, 7, 1, -2}] /. Z → z2s /. ωω → ω /.
{{t → 4/5}}]

Out[ ]= {-3.50 …}

In[ ]:= RootReduce[-Sqrt[z2s (p11 + p12 ωω)] / q /. ωω → ω /. t → 4/5]

Out[ ]= -3.50 …

In[ ]:= rh1a =
Factor[Resultant[(((16 (-1 + t)^3 t^2 (-1 + 5 t - 6 t^2 + t^3))) z22 - (-6 + 25 t + 14 t^2 - 266 t^3 + 648 t^4 - 752 t^5 + 464 t^6 - 144 t^7 + 16 t^8) - ωω (-1 + 2 t) (2 - 3 t - 8 t^2 + 20 t^3 - 14 t^4 + 4 t^5))^2 - ωω^2 (-1 + 2 t)^2 (2 ((t (10 - 41 t - 48 t^2 + 590 t^3 - 1482 t^4 + 1870 t^5 - 1328 t^6 + 526 t^7 - 104 t^8 + 8 t^9 + t (19 - 124 t + 322 t^2 - 422 t^3 + 292 t^4 - 100 t^5 + 12 t^6) ωω)))), t ωω^2 - (4 - 11 t + 8 t^2), ωω]][[5]]

Out[ ]= $-1 + 15 t - 119 t^2 + 661 t^3 - 2848 t^4 + 9996 t^5 - 29356 t^6 + 73220 t^7 - 156256 t^8 + 285808 t^9 - 446560 t^{10} + 591008 t^{11} - 653440 t^{12} + 591424 t^{13} - 425856 t^{14} + 234496 t^{15} - 93440 t^{16} + 24832 t^{17} - 3840 t^{18} + 256 t^{19} + 24 t^3 z22 - 308 t^4 z22 + 1872 t^5 z22 - 6724 t^6 z22 + 13644 t^7 z22 - 4192 t^8 z22 - 73824 t^9 z22 + 294080 t^{10} z22 - 680448 t^{11} z22 + 1113152 t^{12} z22 - 1343232 t^{13} z22 + 1194880 t^{14} z22 - 765952 t^{15} z22 + 338944 t^{16} z22 - 96256 t^{17} z22 + 15360 t^{18} z22 - 1024 t^{19} z22 + 32 t^5 z22^2 - 272 t^6 z22^2 + 160 t^7 z22^2 + 4992 t^8 z22^2 - 17552 t^9 z22^2 - 4512 t^{10} z22^2 + 180576 t^{11} z22^2 - 590592 t^{12} z22^2 + 1058112 t^{13} z22^2 - 1214848 t^{14} z22^2 + 923904 t^{15} z22^2 - 458240 t^{16} z22^2 + 139776 t^{17} z22^2 - 23040 t^{18} z22^2 + 1536 t^{19} z22^2 - 384 t^8 z22^3 + 3520 t^9 z22^3 - 9408 t^{10} z22^3 - 11520 t^{11} z22^3 + 130368 t^{12} z22^3 - 358528 t^{13} z22^3 + 536192 t^{14} z22^3 - 487936 t^{15} z22^3 + 273408 t^{16} z22^3 - 90112 t^{17} z22^3 + 15360 t^{18} z22^3 - 1024 t^{19} z22^3 - 256 t^{10} z22^4 + 3328 t^{11} z22^4 - 17920 t^{12} z22^4 + 52224 t^{13} z22^4 - 90368 t^{14} z22^4 + 95488 t^{15} z22^4 - 60672 t^{16} z22^4 + 21760 t^{17} z22^4 - 3840 t^{18} z22^4 + 256 t^{19} z22^4$

In[ ]:= RootReduce[z2s /. ωω → ω /. t -> 4/5]

Out[ ]= 0.356 …

In[ ]:= Solve[rh1a == 0 /. t → 4/5]

Out[ ]= {{z22 → -16.2 …}, {z22 → -0.0448 …}, {z22 → 0.0955 …}, {z22 → 0.356 …}}

In[ ]:=
```
RootReduce[- Sqrt[z2s (p11 + p12 ωω)] / q /. ωω → ω /. t → 4 / 5]
```

Out[ ]= -3.50…

In[ ]:=
```
rh1b = Factor[Resultant[(b1 q)^2 - (z22 (p11 + p12 ωω)), t ωω^2 - (4 - 11 t + 8 t^2), ωω]][[3]]
```

Out[ ]=

$$b1^{4} - 64\, b1^{4}\, t + 1984\, b1^{4}\, t^{2} - 39\,680\, b1^{4}\, t^{3} + 575\,360\, b1^{4}\, t^{4} - 6\,444\,032\, b1^{4}\, t^{5} + 57\,996\,288\, b1^{4}\, t^{6} -$$
$$430\,829\,568\, b1^{4}\, t^{7} + 2\,692\,684\,800\, b1^{4}\, t^{8} - 14\,360\,985\,600\, b1^{4}\, t^{9} + 66\,060\,533\,760\, b1^{4}\, t^{10} -$$
$$264\,242\,135\,040\, b1^{4}\, t^{11} + 924\,847\,472\,640\, b1^{4}\, t^{12} - 2\,845\,684\,531\,200\, b1^{4}\, t^{13} +$$
$$7\,724\,000\,870\,400\, b1^{4}\, t^{14} - 18\,537\,602\,088\,960\, b1^{4}\, t^{15} + 39\,392\,404\,439\,040\, b1^{4}\, t^{16} -$$
$$74\,150\,408\,355\,840\, b1^{4}\, t^{17} + 123\,584\,013\,926\,400\, b1^{4}\, t^{18} - 182\,123\,809\,996\,800\, b1^{4}\, t^{19} +$$
$$236\,760\,952\,995\,840\, b1^{4}\, t^{20} - 270\,583\,946\,280\,960\, b1^{4}\, t^{21} + 270\,583\,946\,280\,960\, b1^{4}\, t^{22} -$$
$$235\,290\,388\,070\,400\, b1^{4}\, t^{23} + 176\,467\,791\,052\,800\, b1^{4}\, t^{24} - 112\,939\,386\,273\,792\, b1^{4}\, t^{25} +$$
$$60\,813\,515\,685\,888\, b1^{4}\, t^{26} - 27\,028\,229\,193\,728\, b1^{4}\, t^{27} + 9\,652\,938\,997\,760\, b1^{4}\, t^{28} -$$
$$2\,662\,879\,723\,520\, b1^{4}\, t^{29} + 532\,575\,944\,704\, b1^{4}\, t^{30} - 68\,719\,476\,736\, b1^{4}\, t^{31} + 4\,294\,967\,296\, b1^{4}\, t^{32} -$$
$$2000\, b1^{2}\, t^{3}\, z22 + 114\,080\, b1^{2}\, t^{4}\, z22 - 3\,140\,704\, b1^{2}\, t^{5}\, z22 + 55\,693\,168\, b1^{2}\, t^{6}\, z22 -$$
$$716\,174\,528\, b1^{2}\, t^{7}\, z22 + 7\,128\,224\,880\, b1^{2}\, t^{8}\, z22 - 57\,230\,308\,608\, b1^{2}\, t^{9}\, z22 +$$
$$381\,345\,065\,824\, b1^{2}\, t^{10}\, z22 - 2\,153\,063\,133\,312\, b1^{2}\, t^{11}\, z22 + 10\,462\,436\,258\,192\, b1^{2}\, t^{12}\, z22 -$$
$$44\,289\,123\,710\,592\, b1^{2}\, t^{13}\, z22 + 164\,883\,282\,332\,800\, b1^{2}\, t^{14}\, z22 - 543\,940\,716\,781\,312\, b1^{2}\, t^{15}\, z22 +$$
$$1\,599\,741\,382\,089\,472\, b1^{2}\, t^{16}\, z22 - 4\,214\,930\,967\,298\,816\, b1^{2}\, t^{17}\, z22 +$$
$$9\,988\,364\,415\,202\,304\, b1^{2}\, t^{18}\, z22 - 21\,358\,513\,645\,667\,328\, b1^{2}\, t^{19}\, z22 +$$
$$41\,322\,786\,090\,166\,528\, b1^{2}\, t^{20}\, z22 - 72\,499\,981\,573\,314\,560\, b1^{2}\, t^{21}\, z22 +$$
$$115\,577\,092\,035\,942\,400\, b1^{2}\, t^{22}\, z22 - 167\,708\,452\,809\,641\,984\, b1^{2}\, t^{23}\, z22 +$$
$$221\,863\,732\,471\,470\,080\, b1^{2}\, t^{24}\, z22 - 267\,982\,717\,310\,480\,384\, b1^{2}\, t^{25}\, z22 +$$
$$295\,920\,202\,140\,712\,960\, b1^{2}\, t^{26}\, z22 - 299\,016\,953\,488\,588\,800\, b1^{2}\, t^{27}\, z22 +$$
$$276\,568\,034\,669\,826\,048\, b1^{2}\, t^{28}\, z22 - 233\,982\,036\,714\,946\,560\, b1^{2}\, t^{29}\, z22 +$$
$$180\,675\,922\,875\,154\,432\, b1^{2}\, t^{30}\, z22 - 126\,834\,782\,779\,867\,136\, b1^{2}\, t^{31}\, z22 +$$
$$80\,468\,245\,874\,540\,544\, b1^{2}\, t^{32}\, z22 - 45\,777\,581\,955\,350\,528\, b1^{2}\, t^{33}\, z22 +$$
$$23\,130\,200\,063\,606\,784\, b1^{2}\, t^{34}\, z22 - 10\,266\,657\,750\,515\,712\, b1^{2}\, t^{35}\, z22 +$$
$$3\,953\,827\,825\,844\,224\, b1^{2}\, t^{36}\, z22 - 1\,302\,387\,822\,166\,016\, b1^{2}\, t^{37}\, z22 +$$
$$360\,452\,622\,123\,008\, b1^{2}\, t^{38}\, z22 - 81\,704\,404\,385\,792\, b1^{2}\, t^{39}\, z22 + 14\,531\,669\,524\,480\, b1^{2}\, t^{40}\, z22 -$$
$$1\,864\,015\,806\,464\, b1^{2}\, t^{41}\, z22 + 139\,318\,001\,664\, b1^{2}\, t^{42}\, z22 - 1\,073\,741\,824\, b1^{2}\, t^{43}\, z22 -$$
$$536\,870\,912\, b1^{2}\, t^{44}\, z22 - 160\,000\, t^{5}\, z22^{2} + 8\,992\,000\, t^{6}\, z22^{2} - 244\,966\,400\, t^{7}\, z22^{2} +$$
$$4\,322\,894\,080\, t^{8}\, z22^{2} - 55\,711\,506\,176\, t^{9}\, z22^{2} + 560\,418\,149\,632\, t^{10}\, z22^{2} -$$
$$4\,591\,712\,189\,696\, t^{11}\, z22^{2} + 31\,565\,527\,150\,080\, t^{12}\, z22^{2} - 186\,073\,939\,988\,992\, t^{13}\, z22^{2} +$$
$$956\,269\,873\,741\,568\, t^{14}\, z22^{2} - 4\,339\,944\,067\,916\,288\, t^{15}\, z22^{2} + 17\,571\,114\,754\,118\,144\, t^{16}\, z22^{2} -$$
$$63\,977\,084\,333\,880\,064\, t^{17}\, z22^{2} + 210\,838\,201\,898\,284\,800\, t^{18}\, z22^{2} -$$
$$632\,116\,988\,514\,820\,352\, t^{19}\, z22^{2} + 1\,731\,142\,278\,192\,420\,352\, t^{20}\, z22^{2} -$$
$$4\,344\,508\,518\,464\,774\,912\, t^{21}\, z22^{2} + 10\,015\,935\,152\,162\,224\,128\, t^{22}\, z22^{2} -$$
$$21\,251\,566\,164\,902\,695\,936\, t^{23}\, z22^{2} + 41\,554\,764\,515\,736\,895\,744\, t^{24}\, z22^{2} -$$
$$74\,950\,324\,759\,192\,956\,928\, t^{25}\, z22^{2} + 124\,761\,716\,261\,376\,186\,368\, t^{26}\, z22^{2} -$$
$$191\,709\,020\,206\,542\,000\,128\, t^{27}\, z22^{2} + 271\,922\,293\,797\,697\,308\,672\, t^{28}\, z22^{2} -$$
$$355\,948\,309\,725\,438\,832\,640\, t^{29}\, z22^{2} + 429\,832\,584\,484\,632\,838\,144\, t^{30}\, z22^{2} -$$
$$478\,590\,330\,134\,787\,047\,424\, t^{31}\, z22^{2} + 491\,058\,916\,725\,507\,379\,200\, t^{32}\, z22^{2} -$$

$464\,035\,937\,294\,300\,938\,240\ t^{33}\ z22^{2} + 403\,617\,626\,236\,057\,583\,616\ t^{34}\ z22^{2} -$
$322\,973\,317\,689\,942\,081\,536\ t^{35}\ z22^{2} + 237\,659\,627\,199\,746\,408\,448\ t^{36}\ z22^{2} -$
$160\,764\,086\,128\,242\,589\,696\ t^{37}\ z22^{2} + 99\,941\,176\,290\,443\,264\,000\ t^{38}\ z22^{2} -$
$57\,080\,416\,769\,370\,226\,688\ t^{39}\ z22^{2} + 29\,937\,130\,001\,337\,810\,944\ t^{40}\ z22^{2} -$
$14\,406\,243\,322\,205\,044\,736\ t^{41}\ z22^{2} + 6\,351\,748\,818\,822\,234\,112\ t^{42}\ z22^{2} -$
$2\,560\,181\,243\,354\,284\,032\ t^{43}\ z22^{2} + 940\,299\,529\,940\,893\,696\ t^{44}\ z22^{2} -$
$313\,256\,155\,090\,518\,016\ t^{45}\ z22^{2} + 94\,072\,282\,307\,100\,672\ t^{46}\ z22^{2} -$
$25\,250\,156\,337\,168\,384\ t^{47}\ z22^{2} + 5\,988\,304\,444\,981\,248\ t^{48}\ z22^{2} - 1\,235\,608\,731\,123\,712\ t^{49}\ z22^{2} +$
$217\,368\,529\,731\,584\ t^{50}\ z22^{2} - 31\,758\,414\,249\,984\ t^{51}\ z22^{2} + 3\,724\,005\,081\,088\ t^{52}\ z22^{2} -$
$334\,520\,909\,824\ t^{53}\ z22^{2} + 21\,474\,836\,480\ t^{54}\ z22^{2} - 872\,415\,232\ t^{55}\ z22^{2} + 16\,777\,216\ t^{56}\ z22^{2}$

In[ ]:= **rh1c = Factor[Resultant[rh1a, rh1b, z22]][[5]]**

In[ ]:= **Solve[rh1c == 0 /. t → 4 / 5]**

Out[ ]= {{b1 → -13.9 …}, {b1 → -3.50 …}, {b1 → -0.730 …}, {b1 → 1.81 …}}

In[ ]:= **rh2b = Factor[Resultant[(b3 q) ^ 2 - (z22 ^ 3 (p31 + p32 ωω)), t ωω ^ 2 - (4 - 11 t + 8 t^2), ωω]][[3]]**

Out[ ]= $b3^{4} - 64\ b3^{4}\ t + 1984\ b3^{4}\ t^{2} - 39\,680\ b3^{4}\ t^{3} + 575\,360\ b3^{4}\ t^{4} - 6\,444\,032\ b3^{4}\ t^{5} +$
$57\,996\,288\ b3^{4}\ t^{6} - 430\,829\,568\ b3^{4}\ t^{7} + 2\,692\,684\,800\ b3^{4}\ t^{8} - 14\,360\,985\,600\ b3^{4}\ t^{9} +$
$66\,060\,533\,760\ b3^{4}\ t^{10} - 264\,242\,135\,040\ b3^{4}\ t^{11} + 924\,847\,472\,640\ b3^{4}\ t^{12} -$
$2\,845\,684\,531\,200\ b3^{4}\ t^{13} + 7\,724\,000\,870\,400\ b3^{4}\ t^{14} - 18\,537\,602\,088\,960\ b3^{4}\ t^{15} +$
$39\,392\,404\,439\,040\ b3^{4}\ t^{16} - 74\,150\,408\,355\,840\ b3^{4}\ t^{17} + 123\,584\,013\,926\,400\ b3^{4}\ t^{18} -$
$182\,123\,809\,996\,800\ b3^{4}\ t^{19} + 236\,760\,952\,995\,840\ b3^{4}\ t^{20} - 270\,583\,946\,280\,960\ b3^{4}\ t^{21} +$
$270\,583\,946\,280\,960\ b3^{4}\ t^{22} - 235\,290\,388\,070\,400\ b3^{4}\ t^{23} + 176\,467\,791\,052\,800\ b3^{4}\ t^{24} -$
$112\,939\,386\,273\,792\ b3^{4}\ t^{25} + 60\,813\,515\,685\,888\ b3^{4}\ t^{26} - 27\,028\,229\,193\,728\ b3^{4}\ t^{27} +$
$9\,652\,938\,997\,760\ b3^{4}\ t^{28} - 2\,662\,879\,723\,520\ b3^{4}\ t^{29} + 532\,575\,944\,704\ b3^{4}\ t^{30} -$
$68\,719\,476\,736\ b3^{4}\ t^{31} + 4\,294\,967\,296\ b3^{4}\ t^{32} - 2000\ b3^{2}\ t^{3}\ z22^{3} + 114\,080\ b3^{2}\ t^{4}\ z22^{3} -$
$3\,127\,904\ b3^{2}\ t^{5}\ z22^{3} + 55\,114\,608\ b3^{2}\ t^{6}\ z22^{3} - 703\,916\,992\ b3^{2}\ t^{7}\ z22^{3} +$
$6\,967\,487\,600\ b3^{2}\ t^{8}\ z22^{3} - 55\,789\,076\,736\ b3^{2}\ t^{9}\ z22^{3} + 372\,281\,911\,008\ b3^{2}\ t^{10}\ z22^{3} -$
$2\,115\,751\,488\,128\ b3^{2}\ t^{11}\ z22^{3} + 10\,408\,467\,543\,824\ b3^{2}\ t^{12}\ z22^{3} - 44\,877\,448\,613\,504\ b3^{2}\ t^{13}\ z22^{3} +$
$171\,227\,639\,975\,296\ b3^{2}\ t^{14}\ z22^{3} - 582\,562\,709\,408\,256\ b3^{2}\ t^{15}\ z22^{3} +$
$1\,778\,438\,627\,627\,776\ b3^{2}\ t^{16}\ z22^{3} - 4\,897\,036\,990\,405\,120\ b3^{2}\ t^{17}\ z22^{3} +$
$12\,217\,504\,768\,714\,752\ b3^{2}\ t^{18}\ z22^{3} - 27\,726\,442\,260\,625\,408\ b3^{2}\ t^{19}\ z22^{3} +$
$57\,431\,989\,500\,979\,200\ b3^{2}\ t^{20}\ z22^{3} - 108\,899\,443\,675\,897\,856\ b3^{2}\ t^{21}\ z22^{3} +$
$189\,469\,682\,894\,450\,688\ b3^{2}\ t^{22}\ z22^{3} - 303\,022\,079\,346\,184\,192\ b3^{2}\ t^{23}\ z22^{3} +$
$445\,996\,157\,062\,803\,456\ b3^{2}\ t^{24}\ z22^{3} - 604\,365\,096\,264\,478\,720\ b3^{2}\ t^{25}\ z22^{3} +$
$753\,706\,618\,141\,523\,968\ b3^{2}\ t^{26}\ z22^{3} - 863\,833\,527\,831\,281\,664\ b3^{2}\ t^{27}\ z22^{3} +$
$907\,551\,304\,065\,355\,776\ b3^{2}\ t^{28}\ z22^{3} - 870\,690\,628\,526\,112\,768\ b3^{2}\ t^{29}\ z22^{3} +$
$758\,897\,057\,824\,800\,768\ b3^{2}\ t^{30}\ z22^{3} - 597\,126\,645\,392\,998\,400\ b3^{2}\ t^{31}\ z22^{3} +$
$420\,988\,614\,128\,500\,736\ b3^{2}\ t^{32}\ z22^{3} - 263\,708\,256\,761\,806\,848\ b3^{2}\ t^{33}\ z22^{3} +$
$145\,397\,161\,861\,840\,896\ b3^{2}\ t^{34}\ z22^{3} - 69\,832\,265\,638\,608\,896\ b3^{2}\ t^{35}\ z22^{3} +$
$28\,874\,008\,704\,319\,488\ b3^{2}\ t^{36}\ z22^{3} - 10\,133\,962\,106\,077\,184\ b3^{2}\ t^{37}\ z22^{3} +$
$2\,963\,819\,601\,068\,032\ b3^{2}\ t^{38}\ z22^{3} - 703\,016\,252\,473\,344\ b3^{2}\ t^{39}\ z22^{3} +$

$129306483228672\ b3^2\ t^{40}\ z22^3 - 16924318629888\ b3^2\ t^{41}\ z22^3 + 1273189367808\ b3^2\ t^{42}\ z22^3 -$
$9663676416\ b3^2\ t^{43}\ z22^3 - 4831838208\ b3^2\ t^{44}\ z22^3 - 160000\ t^5\ z22^6 + 8992000\ t^6\ z22^6 -$
$244966400\ t^7\ z22^6 + 4335694080\ t^8\ z22^6 - 56368658176\ t^9\ z22^6 + 576806040832\ t^{10}\ z22^6 -$
$4857175608576\ t^{11}\ z22^6 + 34716405255680\ t^{12}\ z22^6 - 215372661502464\ t^{13}\ z22^6 +$
$1179017532690176\ t^{14}\ z22^6 - 5766121998211584\ t^{15}\ z22^6 + 25428376181770752\ t^{16}\ z22^6 -$
$101830223989285632\ t^{17}\ z22^6 + 372273420534707968\ t^{18}\ z22^6 -$
$1247379207151880448\ t^{19}\ z22^6 + 3841938979935204864\ t^{20}\ z22^6 -$
$10899643508122602240\ t^{21}\ z22^6 + 28521907352016113664\ t^{22}\ z22^6 -$
$68897319134135587840\ t^{23}\ z22^6 + 153689991766468780288\ t^{24}\ z22^6 -$
$316609366679068233728\ t^{25}\ z22^6 + 602204932203871948800\ t^{26}\ z22^6 -$
$1057157145543260749824\ t^{27}\ z22^6 + 1711959073435929538560\ t^{28}\ z22^6 -$
$2556007780135777116160\ t^{29}\ z22^6 + 3516337481530179690496\ t^{30}\ z22^6 -$
$4454747533507861676032\ t^{31}\ z22^6 + 5194135862110092451840\ t^{32}\ z22^6 -$
$5570969659876496310272\ t^{33}\ z22^6 + 5493726356725024227328\ t^{34}\ z22^6 -$
$4978958829257214459904\ t^{35}\ z22^6 + 4145576935922258411520\ t^{36}\ z22^6 -$
$3169987403346295717888\ t^{37}\ z22^6 + 2225318868748778733568\ t^{38}\ z22^6 -$
$1433387356929036386304\ t^{39}\ z22^6 + 846480383958296756224\ t^{40}\ z22^6 -$
$457703979652247191552\ t^{41}\ z22^6 + 226149162144972668928\ t^{42}\ z22^6 -$
$101807224693941338112\ t^{43}\ z22^6 + 41588013269773189120\ t^{44}\ z22^6 -$
$15330829548474335232\ t^{45}\ z22^6 + 5062337849116852224\ t^{46}\ z22^6 -$
$1482615644233924608\ t^{47}\ z22^6 + 380138389197815808\ t^{48}\ z22^6 -$
$83908104038645760\ t^{49}\ z22^6 + 15610960328785920\ t^{50}\ z22^6 -$
$2384123947646976\ t^{51}\ z22^6 + 288962648211456\ t^{52}\ z22^6 - 26556235776000\ t^{53}\ z22^6 +$
$1728590118912\ t^{54}\ z22^6 - 70665633792\ t^{55}\ z22^6 + 1358954496\ t^{56}\ z22^6$

In[∘]:= **rh2c = Factor[Resultant[rh1a, rh2b, z22]][[6]]**

Out[∘]= $-625 + 38875\ t - 1197650\ t^2 + 24475580\ t^3 - 1000\ b3\ t^3 - 374568351\ t^4 + 64350\ b3\ t^4 +$
$4590299513\ t^5 - 2023440\ b3\ t^5 + 200\ b3^2\ t^5 - 47002640856\ t^6 + 41334950\ b3\ t^6 - 8820\ b3^2\ t^6 +$
$414042407206\ t^7 - 615401084\ b3\ t^7 + 151748\ b3^2\ t^7 - 3204532355987\ t^8 + 7099875890\ b3\ t^8 -$
$667160\ b3^2\ t^8 + 160\ b3^3\ t^8 + 22138137463085\ t^9 - 65828941890\ b3\ t^9 - 23344496\ b3^2\ t^9 -$
$9240\ b3^3\ t^9 - 138182087993230\ t^{10} + 501033071938\ b3\ t^{10} + 612175196\ b3^2\ t^{10} +$
$253864\ b3^3\ t^{10} - 16\ b3^4\ t^{10} + 786758870284500\ t^{11} - 3156685298440\ b3\ t^{11} -$
$8434477308\ b3^2\ t^{11} - 4365768\ b3^3\ t^{11} + 1072\ b3^4\ t^{11} - 4117364545670237\ t^{12} +$
$16327250578252\ b3\ t^{12} + 81851665904\ b3^2\ t^{12} + 51589768\ b3^3\ t^{12} - 34864\ b3^4\ t^{12} +$
$19927829853144971\ t^{13} - 66375427932198\ b3\ t^{13} - 605995222296\ b3^2\ t^{13} -$
$423241920\ b3^3\ t^{13} + 733200\ b3^4\ t^{13} - 89649763746015368\ t^{14} + 177780113122312\ b3\ t^{14} +$
$3500110806968\ b3^2\ t^{14} + 2114970352\ b3^3\ t^{14} - 11206656\ b3^4\ t^{14} + 376431825893833074\ t^{15} +$
$60430453394096\ b3\ t^{15} - 15385247590416\ b3^2\ t^{15} + 63687824\ b3^3\ t^{15} + 132658176\ b3^4\ t^{15} -$
$1480342260943951152\ t^{16} - 4636262068084792\ b3\ t^{16} + 44338711864256\ b3^2\ t^{16} -$
$127018955424\ b3^3\ t^{16} - 1265506304\ b3^4\ t^{16} + 5467842227738672596\ t^{17} +$
$37771523835896688\ b3\ t^{17} - 1337129171824\ b3^2\ t^{17} + 1562754279392\ b3^3\ t^{17} +$
$9995614208\ b3^4\ t^{17} - 19014299392013918192\ t^{18} - 216962853813848752\ b3\ t^{18} -$
$1013084389884896\ b3^2\ t^{18} - 12623204602496\ b3^3\ t^{18} - 66649702400\ b3^4\ t^{18} +$

62 375 641 942 695 874 792 t^{19} + 1 029 806 241 630 324 320 b3 t^{19} + 8 332 570 458 774 880 $b3^{2}$ t^{19} +
79 965 339 647 744 $b3^{3}$ t^{19} + 380 632 399 872 $b3^{4}$ t^{19} − 193 345 535 581 151 095 648 t^{20} −
4 259 593 245 611 296 576 b3 t^{20} − 46 544 746 339 031 040 $b3^{2}$ t^{20} − 421 825 602 427 520 $b3^{3}$ t^{20} −
1 882 437 992 448 $b3^{4}$ t^{20} + 567 057 789 429 670 848 720 t^{21} + 15 744 168 128 496 985 536 b3 t^{21} +
210 592 265 001 187 648 $b3^{2}$ t^{21} + 1 907 745 944 023 680 $b3^{3}$ t^{21} + 8 131 190 046 720 $b3^{4}$ t^{21} −
1 575 349 016 369 992 505 600 t^{22} − 52 740 976 337 888 449 664 b3 t^{22} −
817 177 104 228 272 256 $b3^{2}$ t^{22} − 7 523 896 012 147 456 $b3^{3}$ t^{22} − 30 881 863 434 240 $b3^{4}$ t^{22} +
4 149 264 709 453 371 034 368 t^{23} + 161 548 136 552 775 907 584 b3 t^{23} +
2 792 486 515 600 393 216 $b3^{2}$ t^{23} + 26 162 077 082 988 800 $b3^{3}$ t^{23} + 103 664 222 208 000 $b3^{4}$ t^{23} −
10 368 513 519 444 537 519 424 t^{24} − 455 163 165 558 923 250 816 b3 t^{24} −
8 527 245 762 585 845 248 $b3^{2}$ t^{24} − 80 814 768 969 734 656 $b3^{3}$ t^{24} − 308 797 424 271 360 $b3^{4}$ t^{24} +
24 594 929 954 242 026 782 016 t^{25} + 1 184 575 594 220 643 016 960 b3 t^{25} +
23 476 365 041 846 565 632 $b3^{2}$ t^{25} + 222 962 555 202 286 080 $b3^{3}$ t^{25} + 818 744 092 262 400 $b3^{4}$ t^{25} −
55 401 978 393 429 928 009 728 t^{26} − 2 856 322 480 618 965 228 544 b3 t^{26} −
58 607 437 732 457 815 040 $b3^{2}$ t^{26} − 551 538 083 958 179 840 $b3^{3}$ t^{26} −
1 936 366 365 573 120 $b3^{4}$ t^{26} + 118 539 401 452 342 742 183 936 t^{27} +
6 395 469 591 454 915 920 896 b3 t^{27} + 133 182 114 045 211 138 048 $b3^{2}$ t^{27} +
1 226 649 510 995 302 400 $b3^{3}$ t^{27} + 4 090 630 860 963 840 $b3^{4}$ t^{27} −
240 940 966 389 578 811 759 104 t^{28} − 13 319 238 793 880 219 378 176 b3 t^{28} −
276 218 449 429 440 904 192 $b3^{2}$ t^{28} − 2 457 500 382 873 927 680 $b3^{3}$ t^{28} −
7 724 000 870 400 000 $b3^{4}$ t^{28} + 465 234 164 663 806 382 711 808 t^{29} +
25 832 108 951 935 683 811 328 b3 t^{29} + 523 793 251 794 188 532 736 $b3^{2}$ t^{29} +
4 440 378 794 872 463 360 $b3^{3}$ t^{29} + 13 035 511 700 520 960 $b3^{4}$ t^{29} −
853 300 089 580 466 958 185 472 t^{30} − 46 697 916 513 973 116 453 888 b3 t^{30} −
909 300 851 409 475 915 776 $b3^{2}$ t^{30} − 7 240 543 324 412 805 120 $b3^{3}$ t^{30} −
19 648 557 329 940 480 $b3^{4}$ t^{30} + 1 486 326 879 360 491 076 760 576 t^{31} +
78 732 922 519 611 906 834 432 b3 t^{31} + 1 446 307 566 593 913 464 832 $b3^{2}$ t^{31} +
10 656 071 682 456 125 440 $b3^{3}$ t^{31} + 26 413 155 986 964 480 $b3^{4}$ t^{31} −
2 458 001 561 667 532 401 808 384 t^{32} − 123 851 369 452 295 708 459 008 b3 t^{32} −
2 108 912 325 202 302 095 360 $b3^{2}$ t^{32} − 14 149 749 635 272 540 160 $b3^{3}$ t^{32} −
31 595 879 265 730 560 $b3^{4}$ t^{32} + 3 857 808 700 971 003 301 682 176 t^{33} +
181 806 625 955 719 186 472 960 b3 t^{33} + 2 820 019 180 263 983 607 808 $b3^{2}$ t^{33} +
16 939 135 492 147 118 080 $b3^{3}$ t^{33} + 33 528 880 300 032 000 $b3^{4}$ t^{33} −
5 743 681 846 227 027 346 812 928 t^{34} − 249 050 112 469 381 335 908 352 b3 t^{34} −
3 458 861 435 545 635 987 456 $b3^{2}$ t^{34} − 18 260 414 633 339 781 120 $b3^{3}$ t^{34} −
31 434 795 846 205 440 $b3^{4}$ t^{34} + 8 107 726 810 514 788 977 788 928 t^{35} +
318 322 872 929 644 003 344 384 b3 t^{35} + 3 891 890 218 130 076 033 024 $b3^{2}$ t^{35} +
17 697 514 235 894 956 032 $b3^{3}$ t^{35} + 25 900 765 918 789 632 $b3^{4}$ t^{35} −
10 844 377 675 480 701 438 849 024 t^{36} − 379 512 862 793 521 040 998 400 b3 t^{36} −
4 017 756 195 715 755 671 552 $b3^{2}$ t^{36} − 15 388 947 033 331 073 024 $b3^{3}$ t^{36} −
18 629 206 971 777 024 $b3^{4}$ t^{36} + 13 734 631 351 484 590 373 707 776 t^{37} +
421 868 756 329 135 507 095 552 b3 t^{37} + 3 805 949 128 198 979 567 616 $b3^{2}$ t^{37} +
11 975 500 020 175 601 664 $b3^{3}$ t^{37} + 11 596 075 618 009 088 $b3^{4}$ t^{37} −

$16\,459\,667\,304\,835\,558\,363\,136\,000\ t^{38} - 436\,996\,922\,728\,242\,226\,872\,320\ b3\,t^{38} -$
$3\,308\,921\,265\,410\,953\,347\,072\ b3^{2}\,t^{38} - 8\,313\,607\,525\,341\,593\,600\ b3^{3}\,t^{38} -$
$6\,177\,880\,958\,566\,400\ b3^{4}\,t^{38} + 18\,650\,002\,932\,810\,444\,456\,968\,192\ t^{39} +$
$421\,532\,781\,313\,910\,501\,769\,216\ b3\,t^{39} + 2\,641\,018\,805\,519\,335\,456\,768\ b3^{2}\,t^{39} +$
$5\,128\,172\,352\,135\,233\,536\ b3^{3}\,t^{39} + 2\,776\,318\,399\,741\,952\ b3^{4}\,t^{39} -$
$19\,963\,309\,385\,306\,269\,436\,821\,504\ t^{40} - 378\,338\,681\,001\,788\,933\,111\,808\ b3\,t^{40} -$
$1\,935\,738\,439\,153\,465\,491\,456\ b3^{2}\,t^{40} - 2\,796\,278\,504\,570\,748\,928\ b3^{3}\,t^{40} -$
$1\,032\,132\,180\,836\,352\ b3^{4}\,t^{40} + 20\,170\,014\,975\,759\,793\,080\,877\,056\ t^{41} +$
$315\,653\,193\,150\,224\,523\,264\,000\ b3\,t^{41} + 1\,303\,164\,173\,767\,899\,676\,672\ b3^{2}\,t^{41} +$
$1\,338\,717\,427\,118\,112\,768\ b3^{3}\,t^{41} + 308\,928\,407\,666\,688\ b3^{4}\,t^{41} -$
$19\,218\,023\,426\,317\,838\,237\,696\,000\ t^{42} - 244\,532\,168\,944\,074\,834\,116\,608\ b3\,t^{42} -$
$805\,713\,186\,218\,863\,755\,264\ b3^{2}\,t^{42} - 557\,535\,295\,264\,784\,384\ b3^{3}\,t^{42} - 71\,536\,975\,282\,176\ b3^{4}\,t^{42} +$
$17\,251\,821\,769\,513\,791\,184\,699\,392\ t^{43} + 175\,669\,602\,850\,620\,785\,426\,432\ b3\,t^{43} +$
$457\,164\,005\,031\,735\,721\,984\ b3^{2}\,t^{43} + 199\,407\,568\,265\,674\,752\ b3^{3}\,t^{43} +$
$12\,025\,908\,428\,800\ b3^{4}\,t^{43} - 14\,576\,953\,953\,258\,988\,486\,262\,784\ t^{44} -$
$116\,852\,094\,529\,266\,460\,917\,760\ b3\,t^{44} - 237\,643\,850\,518\,361\,014\,272\ b3^{2}\,t^{44} -$
$60\,138\,665\,728\,278\,528\ b3^{3}\,t^{44} - 1\,305\,670\,057\,984\ b3^{4}\,t^{44} + 11\,581\,694\,366\,726\,965\,359\,149\,056\ t^{45} +$
$71\,842\,699\,421\,503\,399\,788\,544\ b3\,t^{45} + 112\,827\,939\,710\,429\,036\,544\ b3^{2}\,t^{45} +$
$14\,891\,958\,895\,902\,720\ b3^{3}\,t^{45} + 68\,719\,476\,736\ b3^{4}\,t^{45} - 8\,643\,743\,014\,706\,418\,216\,599\,552\ t^{46} -$
$40\,739\,092\,420\,856\,022\,564\,864\ b3\,t^{46} - 48\,698\,648\,827\,514\,585\,088\ b3^{2}\,t^{46} -$
$2\,908\,669\,964\,451\,840\ b3^{3}\,t^{46} + 6\,053\,181\,065\,687\,364\,580\,671\,488\ t^{47} +$
$21\,252\,124\,015\,033\,732\,038\,656\ b3\,t^{47} + 18\,985\,364\,688\,604\,233\,728\ b3^{2}\,t^{47} +$
$420\,002\,704\,392\,192\ b3^{3}\,t^{47} - 3\,972\,934\,825\,329\,100\,755\,566\,592\ t^{48} -$
$10\,166\,620\,991\,748\,764\,598\,272\ b3\,t^{48} - 6\,628\,644\,904\,803\,237\,888\ b3^{2}\,t^{48} -$
$39\,814\,346\,833\,920\ b3^{3}\,t^{48} + 2\,440\,786\,155\,466\,067\,312\,640\,000\ t^{49} +$
$4\,442\,362\,632\,307\,854\,016\,512\ b3\,t^{49} + 2\,049\,770\,201\,926\,336\,512\ b3^{2}\,t^{49} +$
$1\,855\,425\,871\,872\ b3^{3}\,t^{49} - 1\,401\,562\,307\,461\,280\,584\,171\,520\ t^{50} -$
$1\,764\,188\,848\,098\,071\,543\,808\ b3\,t^{50} - 553\,038\,503\,965\,884\,416\ b3^{2}\,t^{50} +$
$750\,991\,743\,117\,609\,447\,981\,056\ t^{51} + 632\,720\,312\,614\,483\,132\,416\ b3\,t^{51} +$
$127\,442\,471\,046\,086\,656\ b3^{2}\,t^{51} - 374\,750\,111\,566\,030\,596\,734\,976\ t^{52} -$
$203\,276\,852\,939\,301\,322\,752\ b3\,t^{52} - 24\,284\,547\,445\,161\,984\ b3^{2}\,t^{52} +$
$173\,741\,696\,179\,554\,287\,091\,712\ t^{53} + 57\,895\,669\,533\,763\,436\,544\ b3\,t^{53} +$
$3\,629\,249\,244\,168\,192\ b3^{2}\,t^{53} - 74\,623\,355\,271\,683\,325\,820\,928\ t^{54} -$
$14\,422\,661\,953\,241\,481\,216\ b3\,t^{54} - 385\,516\,264\,488\,960\ b3^{2}\,t^{54} +$
$29\,589\,083\,573\,551\,500\,361\,728\ t^{55} + 3\,088\,088\,475\,522\,564\,096\ b3\,t^{55} + 22\,690\,312\,224\,768\ b3^{2}\,t^{55} -$
$10\,784\,707\,641\,587\,382\,878\,208\ t^{56} - 555\,327\,075\,410\,509\,824\ b3\,t^{56} + 77\,309\,411\,328\ b3^{2}\,t^{56} +$
$3\,594\,274\,336\,279\,034\,331\,136\ t^{57} + 81\,284\,952\,678\,727\,680\ b3\,t^{57} - 77\,309\,411\,328\ b3^{2}\,t^{57} -$
$1\,088\,210\,423\,945\,084\,534\,784\ t^{58} - 9\,261\,948\,931\,670\,016\ b3\,t^{58} + 296\,910\,617\,803\,594\,137\,600\ t^{59} +$
$766\,917\,816\,090\,624\ b3\,t^{59} - 72\,285\,108\,756\,623\,130\,624\ t^{60} - 40\,833\,864\,695\,808\ b3\,t^{60} +$
$15\,512\,481\,752\,911\,183\,872\ t^{61} + 1\,043\,677\,052\,928\ b3\,t^{61} - 2\,890\,527\,043\,139\,665\,920\ t^{62} +$
$458\,969\,907\,682\,344\,960\ t^{63} - 60\,638\,588\,043\,264\,000\ t^{64} + 6\,460\,045\,680\,181\,248\ t^{65} -$
$531\,115\,655\,823\,360\ t^{66} + 31\,506\,001\,035\,264\ t^{67} - 1\,195\,879\,956\,480\ t^{68} + 21\,743\,271\,936\ t^{69}$

In[ ]:=
```
Solve[rh2c == 0 /. t → 4 / 5]
```

Out[ ]=
```
{{b3 → -671. …}, {b3 → -1.23 …}, {b3 → -0.0972 …}, {b3 → 8.85 …}}
```

In[ ]:=
```
RootReduce[Sqrt[z2s ^ 3 (p31 + p32 ωω)] / q /. ωω → ω /. t → 4 / 5]
```

Out[ ]=
```
8.85 …
```

In[ ]:=
```
RootReduce[
 1 / q {0, 0, -Sqrt[p31 + p32 ωω], Sqrt[p11 + p12 ωω]}.Table[(-Sqrt[Z]) ^ j, {j, 7, 1, -2}] /.
    Z → z2s /. ωω → ω /. {{t → 4 / 5}}]
```

Out[ ]=
```
{5.35 …}
```

In[ ]:=
```
rh2d = Factor[Resultant[b1 + b3 - b13, rh1c, b1]];
```

In[ ]:=
```
rh2e = Factor[Resultant[rh2d, rh2c, b3]][[2]]
```

In[ ]:=
```
Solve[rh2e == 0 /. t → 4 / 5]
```

Out[ ]=
```
{{b13 → -685. …}, {b13 → -0.828 …}, {b13 → 0.581 …}, {b13 → 5.35 …}}
```

In[ ]:=
```
rh3b = Factor[Resultant[(b5 q) ^ 2 - (z22 ^ 5 (p51 + p52 ωω)), t ωω ^ 2 - (4 - 11 t + 8 t^2), ωω]][[3]];
```

In[ ]:=
```
rh3c = Factor[Resultant[rh1a, rh3b, z22]][[5]]
```

In[ ]:=
```
Solve[rh3c == 0 /. t → 4 / 5]
```

Out[ ]=
```
{{b5 → -7.38 … × 10^3}, {b5 → -5.70 …}, {b5 → -2.95 … × 10^-3}, {b5 → 0.212 …}}
```

In[ ]:=
```
RootReduce[-Sqrt[z2s ^ 5 (p51 + p52 ωω)] / q /. ωω → ω /. t → 4 / 5]
```

Out[ ]=
```
-5.70 …
```

In[ ]:=
```
rh4b = Factor[Resultant[(b7 q) ^ 2 - (z22 ^ 7 (p71 + p72 ωω)), t ωω ^ 2 - (4 - 11 t + 8 t^2), ωω]][[3]];
```

In[ ]:=
```
rh4c = Factor[Resultant[rh1a, rh4b, z22]][[6]]
```

Out[ ]=

$$1 - 58\,t + 1702\,t^2 - 33684\,t^3 - 8\,b7\,t^3 + 505568\,t^4 - 10\,b7\,t^4 - 6134800\,t^5 + 10936\,b7\,t^5 - 8\,b7^2\,t^5 + 62649048\,t^6 - 350684\,b7\,t^6 - 452\,b7^2\,t^6 - 553381760\,t^7 + 6098670\,b7\,t^7 + 28088\,b7^2\,t^7 + 4312553702\,t^8 - 71006700\,b7\,t^8 - 556836\,b7^2\,t^8 + 32\,b7^3\,t^8 - 30096665516\,t^9 + 585361892\,b7\,t^9 + 4407828\,b7^2\,t^9 - 1720\,b7^3\,t^9 + 190282870428\,t^{10} - 3265937362\,b7\,t^{10} + 23442424\,b7^2\,t^{10} + 43400\,b7^3\,t^{10} + 16\,b7^4\,t^{10} - 1099937566840\,t^{11} + 7917944102\,b7\,t^{11} - 1045146304\,b7^2\,t^{11} - 668016\,b7^3\,t^{11} - 1120\,b7^4\,t^{11} + 5856678006564\,t^{12} + 68772238824\,b7\,t^{12} + 14177534044\,b7^2\,t^{12} + 6626504\,b7^3\,t^{12} + 38128\,b7^4\,t^{12} - 28900176000248\,t^{13} - 1136333784054\,b7\,t^{13} - 120414735968\,b7^2\,t^{13} - 35924192\,b7^3\,t^{13} - 841024\,b7^4\,t^{13} + 132836890014192\,t^{14} + 9742263986648\,b7\,t^{14} + 698056662424\,b7^2\,t^{14} - 86904840\,b7^3\,t^{14} + 13511920\,b7^4\,t^{14} - 571156355636272\,t^{15} - 62778228984280\,b7\,t^{15} - 2527523397384\,b7^2\,t^{15} + 4500479096\,b7^3\,t^{15} - 168512608\,b7^4\,t^{15} + 2305542905620129\,t^{16} + 331883320068598\,b7\,t^{16} + 1586185084352\,b7^2\,t^{16} - 60216293136\,b7^3\,t^{16} + 1697834000\,b7^4\,t^{16} - 8764027694315082\,t^{17} - 1489081940845132\,b7\,t^{17} +$$

$52\,071\,602\,511\,416\ b7^2\ t^{17} + 558\,160\,755\,040\ b7^3\ t^{17} - 14\,201\,314\,304\ b7^4\ t^{17} +$
$31\,454\,553\,475\,425\,486\ t^{18} + 5\,745\,880\,167\,446\,160\ b7\ t^{18} - 439\,558\,446\,003\,064\ b7^2\ t^{18} -$
$4\,119\,141\,486\,176\ b7^3\ t^{18} + 100\,565\,722\,112\ b7^4\ t^{18} - 106\,828\,427\,686\,954\,260\ t^{19} -$
$19\,056\,001\,563\,478\,592\ b7\ t^{19} + 2\,201\,025\,831\,560\,608\ b7^2\ t^{19} + 25\,470\,377\,076\,800\ b7^3\ t^{19} -$
$611\,833\,856\,000\ b7^4\ t^{19} + 343\,993\,028\,288\,108\,500\ t^{20} + 53\,341\,916\,633\,530\,480\ b7\ t^{20} -$
$7\,764\,115\,544\,889\,952\ b7^2\ t^{20} - 135\,297\,211\,727\,424\ b7^3\ t^{20} + 3\,234\,279\,913\,472\ b7^4\ t^{20} -$
$1\,051\,935\,046\,662\,742\,184\ t^{21} - 118\,898\,625\,939\,040\,448\ b7\ t^{21} + 18\,370\,436\,554\,395\,936\ b7^2\ t^{21} +$
$626\,060\,916\,984\,576\ b7^3\ t^{21} - 14\,987\,050\,926\,080\ b7^4\ t^{21} + 3\,059\,272\,858\,693\,125\,448\ t^{22} +$
$167\,745\,807\,706\,891\,136\ b7\ t^{22} - 14\,937\,332\,869\,477\,440\ b7^2\ t^{22} - 2\,544\,389\,494\,701\,376\ b7^3\ t^{22} +$
$61\,303\,379\,951\,616\ b7^4\ t^{22} - 8\,471\,496\,081\,610\,598\,384\ t^{23} + 127\,025\,838\,240\,442\,880\ b7\ t^{23} -$
$110\,809\,866\,226\,757\,312\ b7^2\ t^{23} + 9\,125\,329\,704\,995\,072\ b7^3\ t^{23} - 222\,585\,820\,643\,328\ b7^4\ t^{23} +$
$22\,359\,212\,565\,076\,545\,312\ t^{24} - 2\,024\,412\,956\,901\,346\,528\ b7\ t^{24} + 722\,922\,158\,938\,530\,560\ b7^2\ t^{24} -$
$28\,946\,004\,712\,899\,456\ b7^3\ t^{24} + 720\,566\,871\,244\,800\ b7^4\ t^{24} - 56\,295\,911\,695\,761\,999\,520\ t^{25} +$
$9\,303\,321\,482\,689\,377\,408\ b7\ t^{25} - 2\,706\,663\,750\,661\,943\,296\ b7^2\ t^{25} +$
$81\,211\,939\,795\,431\,936\ b7^3\ t^{25} - 2\,087\,010\,895\,134\,720\ b7^4\ t^{25} + 135\,308\,488\,420\,410\,373\,600\ t^{26} -$
$31\,493\,061\,027\,355\,014\,976\ b7\ t^{26} + 7\,634\,078\,013\,109\,384\,320\ b7^2\ t^{26} -$
$201\,034\,008\,085\,854\,976\ b7^3\ t^{26} + 5\,422\,655\,137\,382\,400\ b7^4\ t^{26} - 310\,631\,078\,149\,246\,207\,808\ t^{27} +$
$89\,306\,117\,239\,623\,036\,160\ b7\ t^{27} - 17\,268\,401\,306\,448\,626\,432\ b7^2\ t^{27} +$
$436\,427\,338\,506\,115\,072\ b7^3\ t^{27} - 12\,664\,759\,658\,741\,760\ b7^4\ t^{27} +$
$681\,435\,575\,903\,734\,238\,464\ t^{28} - 221\,756\,049\,619\,691\,266\,176\ b7\ t^{28} +$
$31\,624\,840\,169\,387\,159\,296\ b7^2\ t^{28} - 820\,762\,020\,244\,605\,440\ b7^3\ t^{28} +$
$26\,623\,736\,642\,273\,280\ b7^4\ t^{28} - 1\,428\,898\,282\,750\,054\,142\,592\ t^{29} +$
$491\,872\,022\,732\,272\,549\,888\ b7\ t^{29} - 45\,434\,531\,503\,282\,988\,032\ b7^2\ t^{29} +$
$1\,303\,534\,041\,444\,020\,224\ b7^3\ t^{29} - 50\,415\,773\,260\,185\,600\ b7^4\ t^{29} +$
$2\,864\,588\,186\,362\,268\,804\,224\ t^{30} - 984\,011\,848\,096\,767\,288\,576\ b7\ t^{30} +$
$44\,908\,787\,539\,947\,970\,048\ b7^2\ t^{30} - 1\,643\,968\,897\,597\,085\,696\ b7^3\ t^{30} +$
$86\,017\,725\,903\,667\,200\ b7^4\ t^{30} - 5\,490\,965\,898\,010\,076\,049\,664\ t^{31} +$
$1\,782\,403\,630\,872\,326\,166\,016\ b7\ t^{31} - 9\,333\,780\,152\,739\,737\,600\ b7^2\ t^{31} +$
$1\,323\,188\,691\,707\,846\,656\ b7^3\ t^{31} - 132\,189\,363\,948\,748\,800\ b7^4\ t^{31} +$
$10\,063\,698\,445\,996\,949\,809\,664\ t^{32} - 2\,921\,739\,362\,611\,359\,999\,488\ b7\ t^{32} -$
$77\,781\,112\,600\,307\,707\,904\ b7^2\ t^{32} + 414\,758\,544\,307\,036\,160\ b7^3\ t^{32} +$
$182\,816\,530\,916\,966\,400\ b7^4\ t^{32} - 17\,633\,647\,375\,832\,273\,074\,688\ t^{33} +$
$4\,311\,098\,465\,957\,327\,602\,688\ b7\ t^{33} + 208\,887\,495\,242\,505\,754\,624\ b7^2\ t^{33} -$
$4\,291\,010\,805\,155\,364\,864\ b7^3\ t^{33} - 227\,204\,543\,388\,057\,600\ b7^4\ t^{33} +$
$29\,533\,392\,182\,386\,004\,709\,888\ t^{34} - 5\,653\,455\,777\,209\,103\,752\,192\ b7\ t^{34} -$
$335\,242\,487\,629\,484\,298\,240\ b7^2\ t^{34} + 10\,516\,518\,228\,498\,874\,368\ b7^3\ t^{34} +$
$253\,222\,230\,530\,457\,600\ b7^4\ t^{34} - 47\,265\,069\,628\,267\,115\,971\,584\ t^{35} +$
$6\,407\,284\,833\,683\,362\,514\,944\ b7\ t^{35} + 370\,657\,381\,018\,723\,721\,216\ b7^2\ t^{35} -$
$18\,351\,613\,606\,415\,695\,872\ b7^3\ t^{35} - 252\,387\,673\,623\,232\,512\ b7^4\ t^{35} +$
$72\,252\,115\,970\,798\,812\,224\,512\ t^{36} - 5\,847\,196\,496\,082\,500\,558\,848\ b7\ t^{36} -$
$226\,929\,963\,654\,690\,856\,960\ b7^2\ t^{36} + 26\,060\,293\,767\,821\,000\,704\ b7^3\ t^{36} +$
$224\,164\,772\,566\,794\,240\ b7^4\ t^{36} - 105\,445\,944\,186\,788\,395\,495\,424\ t^{37} +$
$3\,257\,601\,261\,381\,263\,130\,624\ b7\ t^{37} - 131\,227\,586\,312\,532\,918\,272\ b7^2\ t^{37} -$

$31 466 869 748 324 630 528\ b7^3 t^{37} - 176 620 790 135 914 496\ b7^4 t^{37} +$
$146 832 353 358 569 652 236 288\ t^{38} + 1 768 935 826 557 424 496 640\ b7 t^{38} +$
$646 406 125 932 546 613 248\ b7^2 t^{38} + 32 917 058 293 364 424 704\ b7^3 t^{38} +$
$122 754 494 646 714 368\ b7^4 t^{38} - 194 951 586 005 312 643 842 048\ t^{39} -$
$9 036 240 431 991 553 802 240\ b7 t^{39} - 1 177 630 003 780 308 975 616\ b7^2 t^{39} -$
$30 085 345 052 180 086 784\ b7^3 t^{39} - 74 727 395 101 245 440\ b7^4 t^{39} +$
$246 604 764 217 589 686 616 064\ t^{40} + 17 606 928 160 921 574 096 896\ b7 t^{40} +$
$1 561 550 828 018 730 614 784\ b7^2 t^{40} + 24 101 179 181 607 419 904\ b7^3 t^{40} +$
$39 490 805 873 770 496\ b7^4 t^{40} - 296 931 988 325 592 746 549 248\ t^{41} -$
$25 944 997 600 156 385 935 360\ b7 t^{41} - 1 690 307 673 804 833 161 216\ b7^2 t^{41} -$
$16 920 764 776 882 110 464\ b7^3 t^{41} - 17 912 161 107 968 000\ b7^4 t^{41} +$
$339 983 176 584 235 475 918 848\ t^{42} + 32 340 985 335 899 651 424 256\ b7 t^{42} +$
$1 557 176 686 427 904 311 296\ b7^2 t^{42} + 10 384 087 851 582 095 360\ b7^3 t^{42} +$
$6 871 037 140 533 248\ b7^4 t^{42} - 369 758 155 472 920 019 976 192\ t^{43} -$
$35 469 403 502 892 167 200 768\ b7 t^{43} - 1 245 048 110 077 294 673 920\ b7^2 t^{43} -$
$5 543 455 391 993 561 088\ b7^3 t^{43} - 2 185 554 238 111 744\ b7^4 t^{43} +$
$381 506 068 880 004 013 096 960\ t^{44} + 34 835 803 206 223 656 550 400\ b7 t^{44} +$
$873 079 255 522 965 520 384\ b7^2 t^{44} + 2 555 865 799 990 444 032\ b7^3 t^{44} +$
$560 922 728 857 600\ b7^4 t^{44} - 372 921 666 065 312 030 851 072\ t^{45} -$
$30 907 725 087 632 165 175 296\ b7 t^{45} - 540 181 949 143 956 586 496\ b7^2 t^{45} -$
$1 007 681 411 177 512 960\ b7^3 t^{45} - 111 600 430 219 264\ b7^4 t^{45} +$
$344 840 078 143 831 081 943 040\ t^{46} + 24 879 079 979 923 211 681 792\ b7 t^{46} +$
$295 946 636 302 116 454 400\ b7^2 t^{46} + 335 168 147 571 081 216\ b7^3 t^{46} + 16 149 077 032 960\ b7^4 t^{46} -$
$301 156 190 293 307 544 961 024\ t^{47} - 18 199 486 273 925 067 571 200\ b7 t^{47} -$
$143 909 374 477 304 070 144\ b7^2 t^{47} - 92 320 219 485 175 808\ b7^3 t^{47} - 1 511 828 488 192\ b7^4 t^{47} +$
$247 949 817 830 337 871 216 640\ t^{48} + 12 098 582 662 742 222 700 544\ b7 t^{48} +$
$62 214 174 569 854 402 560\ b7^2 t^{48} + 20 513 790 839 750 656\ b7^3 t^{48} + 68 719 476 736\ b7^4 t^{48} -$
$192 081 914 760 517 159 616 512\ t^{49} - 7 299 770 360 243 501 137 920\ b7 t^{49} -$
$23 939 984 040 189 231 104\ b7^2 t^{49} - 3 536 879 798 452 224\ b7^3 t^{49} +$
$139 712 458 817 817 308 954 624\ t^{50} + 3 988 257 840 637 229 137 920\ b7 t^{50} +$
$8 202 372 083 146 031 104\ b7^2 t^{50} + 444 462 543 142 912\ b7^3 t^{50} -$
$95 191 961 727 827 165 577 216\ t^{51} - 1 966 731 522 254 136 934 400\ b7 t^{51} -$
$2 498 298 324 721 860 608\ b7^2 t^{51} - 36 258 113 912 832\ b7^3 t^{51} + 60 600 871 231 511 420 207 104\ t^{52} +$
$871 703 119 125 131 821 056\ b7 t^{52} + 672 737 448 366 702 592\ b7^2 t^{52} + 1 443 109 011 456\ b7^3 t^{52} -$
$35 947 097 544 282 148 962 304\ t^{53} - 345 442 379 495 668 449 280\ b7 t^{53} -$
$158 217 588 235 567 104\ b7^2 t^{53} + 19 807 574 456 001 005 879 296\ t^{54} +$
$121 608 279 162 204 717 056\ b7 t^{54} + 31 788 349 769 383 936\ b7^2 t^{54} -$
$10 104 737 257 555 038 830 592\ t^{55} - 37 730 044 734 726 995 968\ b7 t^{55} -$
$5 261 526 600 515 584\ b7^2 t^{55} + 4 754 853 357 688 900 812 800\ t^{56} +$
$10 216 156 816 415 391 744\ b7 t^{56} + 676 289 576 960 000\ b7^2 t^{56} -$
$2 055 341 493 084 737 241 088\ t^{57} - 2 384 625 634 656 649 216\ b7 t^{57} - 60 597 693 579 264\ b7^2 t^{57} +$
$812 411 022 081 347 551 232\ t^{58} + 472 329 367 880 466 432\ b7 t^{58} + 2 847 563 317 248\ b7^2 t^{58} -$
$292 130 908 439 868 080 128\ t^{59} - 77 759 288 784 715 776\ b7 t^{59} + 34 359 738 368\ b7^2 t^{59} +$

95 007 496 406 879 436 800 t^60 + 10 341 817 358 745 600 b7 t^60 - 8 589 934 592 b7^2 t^60 -
27 760 166 140 075 048 960 t^61 - 1 066 301 598 466 048 b7 t^61 + 7 231 365 573 995 659 264 t^62 +
79 862 366 732 288 b7 t^62 - 1 664 260 892 717 481 984 t^63 - 3 859 564 986 368 b7 t^63 +
334 758 827 641 536 512 t^64 + 90 194 313 216 b7 t^64 - 58 080 476 765 618 176 t^65 +
8 549 765 809 700 864 t^66 - 1 045 287 732 772 864 t^67 + 103 119 346 204 672 t^68 -
7 875 090 972 672 t^69 + 436 207 616 000 t^70 - 15 569 256 448 t^71 + 268 435 456 t^72

In[ ]:= **Solve[rh4c == 0 /. t → 4 / 5]**

Out[ ]= {{b7 → -2.52 … × 10^3}, {b7 → -0.0106 …}, {b7 → -2.79 … × 10^-6}, {b7 → 1.06 …}}

In[ ]:= **RootReduce[Sqrt[z2s ^ 7 (p71 + p72 ωω)] / q /. ωω → ω /. t → 4 / 5]**

Out[ ]= 1.06 …

In[ ]:= **rh4d = Factor[Resultant[b5 + b7 - b57, rh3c, b5]];**

In[ ]:= **rh4e = Factor[Resultant[rh4d, rh4c, b7]]**

In[ ]:= **Length[rh4e]**

Out[ ]= 7

In[ ]:= **rh4e[[5]]**

In[ ]:= **Solve[rh4e[[5]] == 0 /. t → 4 / 5]**

Out[ ]= {{b57 → -9.90 … × 10^3}, {b57 → -4.63 …}, {b57 → -2.96 … × 10^-3}, {b57 → 0.202 …}}

In[ ]:= **RootReduce[**
1 / q {-Sqrt[p71 + p72 ωω], Sqrt[p51 + p52 ωω], 0, 0}.Table[(-Sqrt[Z])^j, {j, 7, 1, -2}] /.
Z → z2s /. ωω → ω /. {{t → 4 / 5}}]

Out[ ]= {-4.63 …}

In[ ]:= **rh5a = Factor[Resultant[b13 + b57 - y, rh2e, b13]];**

In[ ]:= **rh5b = Factor[Resultant[rh5a, rh4e[[5]], b57]]**

In[ ]:= **rh5b[[5]]**

Out[ ]= -4096 + 148 480 t - 2 750 720 t^2 + 34 749 824 t^3 - 336 526 192 t^4 + 2 659 653 476 t^5 -
17 816 570 327 t^6 + 103 669 805 970 t^7 - 532 673 407 533 t^8 + 2 444 555 432 428 t^9 -
10 101 516 992 278 t^10 + 37 808 103 046 200 t^11 - 128 736 341 031 482 t^12 + 400 097 778 377 888 t^13 -
1 137 744 898 086 151 t^14 + 2 965 536 850 326 350 t^15 - 7 093 301 577 214 869 t^16 +
15 579 473 043 083 968 t^17 - 31 424 558 991 009 676 t^18 + 58 188 795 780 620 280 t^19 -
98 832 142 780 309 764 t^20 + 153 771 297 026 767 552 t^21 - 218 772 834 488 230 896 t^22 +
283 964 518 819 782 336 t^23 - 335 334 923 634 828 768 t^24 + 359 082 661 480 751 680 t^25 -
347 305 120 815 149 760 t^26 + 302 022 806 671 910 528 t^27 - 234 884 594 325 708 288 t^28 +
162 340 823 171 777 024 t^29 - 98 977 513 449 947 392 t^30 + 52 763 299 284 114 944 t^31 -
24 330 463 229 814 016 t^32 + 9 577 133 976 019 968 t^33 - 3 164 554 413 297 664 t^34 +
858 818 914 918 400 t^35 - 185 838 351 155 200 t^36 + 30 727 222 591 488 t^37 -

$3 631 831 056 384\ t^{38} + 272 092 889 088\ t^{39} - 9 663 676 416\ t^{40} - 512\ t^{3}\ y + 36 480\ t^{4}\ y -$
$862 368\ t^{5}\ y + 10 578 472\ t^{6}\ y - 71 258 236\ t^{7}\ y + 129 341 869\ t^{8}\ y + 2 786 256 320\ t^{9}\ y -$
$38 165 474 712\ t^{10}\ y + 295 155 126 592\ t^{11}\ y - 1 688 825 202 801\ t^{12}\ y + 7 745 491 543 804\ t^{13}\ y -$
$29 539 529 842 228\ t^{14}\ y + 95 567 084 428 168\ t^{15}\ y - 265 211 205 189 724\ t^{16}\ y +$
$634 568 767 617 900\ t^{17}\ y - 1 308 675 104 905 300\ t^{18}\ y + 2 309 673 007 928 456\ t^{19}\ y -$
$3 422 964 145 264 132\ t^{20}\ y + 4 063 930 244 975 440\ t^{21}\ y - 3 328 525 537 082 832\ t^{22}\ y +$
$362 287 730 145 472\ t^{23}\ y + 5 031 272 957 570 880\ t^{24}\ y - 11 916 590 513 322 944\ t^{25}\ y +$
$18 346 637 582 050 816\ t^{26}\ y - 22 202 048 974 222 720\ t^{27}\ y + 22 291 811 606 586 368\ t^{28}\ y -$
$18 958 202 256 457 728\ t^{29}\ y + 13 762 753 646 345 216\ t^{30}\ y - 8 537 042 285 750 272\ t^{31}\ y +$
$4 508 930 756 182 016\ t^{32}\ y - 2 012 599 688 642 560\ t^{33}\ y + 750 296 622 743 552\ t^{34}\ y -$
$229 579 662 491 648\ t^{35}\ y + 56 196 285 202 432\ t^{36}\ y - 10 581 868 544 000\ t^{37}\ y +$
$1 438 010 834 944\ t^{38}\ y - 125 275 471 872\ t^{39}\ y + 5 234 491 392\ t^{40}\ y + 128\ t^{5}\ y^{2} + 944\ t^{6}\ y^{2} -$
$121 024\ t^{7}\ y^{2} + 2 435 295\ t^{8}\ y^{2} - 25 309 618\ t^{9}\ y^{2} + 150 214 572\ t^{10}\ y^{2} - 338 717 930\ t^{11}\ y^{2} -$
$2 716 061 235\ t^{12}\ y^{2} + 35 586 205 432\ t^{13}\ y^{2} - 228 758 901 298\ t^{14}\ y^{2} + 1 038 778 158 408\ t^{15}\ y^{2} -$
$3 641 811 626 338\ t^{16}\ y^{2} + 10 209 673 867 420\ t^{17}\ y^{2} - 23 229 240 646 864\ t^{18}\ y^{2} +$
$43 067 989 979 784\ t^{19}\ y^{2} - 64 999 863 846 764\ t^{20}\ y^{2} + 80 441 318 627 968\ t^{21}\ y^{2} -$
$87 334 674 313 120\ t^{22}\ y^{2} + 105 688 325 071 488\ t^{23}\ y^{2} - 180 692 976 848 352\ t^{24}\ y^{2} +$
$356 158 390 490 240\ t^{25}\ y^{2} - 627 743 179 812 288\ t^{26}\ y^{2} + 917 571 987 183 616\ t^{27}\ y^{2} -$
$1 106 630 331 519 232\ t^{28}\ y^{2} + 1 109 792 927 015 936\ t^{29}\ y^{2} - 931 896 661 092 352\ t^{30}\ y^{2} +$
$657 693 440 925 696\ t^{31}\ y^{2} - 390 390 706 241 536\ t^{32}\ y^{2} + 194 478 675 722 240\ t^{33}\ y^{2} -$
$80 920 576 049 152\ t^{34}\ y^{2} + 27 904 990 773 248\ t^{35}\ y^{2} - 7 880 314 781 696\ t^{36}\ y^{2} +$
$1 787 806 613 504\ t^{37}\ y^{2} - 315 265 908 736\ t^{38}\ y^{2} + 40 653 291 520\ t^{39}\ y^{2} - 3 388 997 632\ t^{40}\ y^{2} +$
$134 217 728\ t^{41}\ y^{2} + 8\ t^{8}\ y^{3} - 202\ t^{9}\ y^{3} - 273\ t^{10}\ y^{3} + 87 928\ t^{11}\ y^{3} - 1 942 927\ t^{12}\ y^{3} +$
$24 965 964\ t^{13}\ y^{3} - 227 100 424\ t^{14}\ y^{3} + 1 579 091 256\ t^{15}\ y^{3} - 8 743 747 008\ t^{16}\ y^{3} +$
$39 530 964 420\ t^{17}\ y^{3} - 148 289 139 060\ t^{18}\ y^{3} + 466 280 733 784\ t^{19}\ y^{3} - 1 235 973 648 972\ t^{20}\ y^{3} +$
$2 765 663 780 976\ t^{21}\ y^{3} - 5 205 285 494 432\ t^{22}\ y^{3} + 8 148 562 651 392\ t^{23}\ y^{3} -$
$10 336 766 132 480\ t^{24}\ y^{3} + 9 948 814 128 128\ t^{25}\ y^{3} - 5 692 194 596 864\ t^{26}\ y^{3} -$
$1 905 393 430 528\ t^{27}\ y^{3} + 10 212 250 810 368\ t^{28}\ y^{3} - 15 862 040 682 496\ t^{29}\ y^{3} +$
$16 889 421 414 400\ t^{30}\ y^{3} - 13 848 250 941 440\ t^{31}\ y^{3} + 9 035 515 887 616\ t^{32}\ y^{3} -$
$4 720 780 378 112\ t^{33}\ y^{3} + 1 959 608 975 360\ t^{34}\ y^{3} - 633 610 960 896\ t^{35}\ y^{3} + 154 131 496 960\ t^{36}\ y^{3} -$
$26 576 158 720\ t^{37}\ y^{3} + 2 900 361 216\ t^{38}\ y^{3} - 150 994 944\ t^{39}\ y^{3} - t^{10}\ y^{4} + 50\ t^{11}\ y^{4} - 1203\ t^{12}\ y^{4} +$
$18 544\ t^{13}\ y^{4} - 205 715\ t^{14}\ y^{4} + 1 748 874\ t^{15}\ y^{4} - 11 847 485\ t^{16}\ y^{4} + 65 652 532\ t^{17}\ y^{4} -$
$303 151 596\ t^{18}\ y^{4} + 1 182 149 760\ t^{19}\ y^{4} - 3 931 550 832\ t^{20}\ y^{4} + 11 232 064 320\ t^{21}\ y^{4} -$
$27 706 743 616\ t^{22}\ y^{4} + 59 214 199 808\ t^{23}\ y^{4} - 109 855 142 400\ t^{24}\ y^{4} + 177 017 808 896\ t^{25}\ y^{4} -$
$247 564 564 480\ t^{26}\ y^{4} + 299 858 362 368\ t^{27}\ y^{4} - 313 427 288 064\ t^{28}\ y^{4} + 281 219 727 360\ t^{29}\ y^{4} -$
$215 000 383 488\ t^{30}\ y^{4} + 138 664 345 600\ t^{31}\ y^{4} - 74 425 892 864\ t^{32}\ y^{4} + 32 629 850 112\ t^{33}\ y^{4} -$
$11 380 981 760\ t^{34}\ y^{4} + 3 036 676 096\ t^{35}\ y^{4} - 581 959 680\ t^{36}\ y^{4} + 71 303 168\ t^{37}\ y^{4} - 4 194 304\ t^{38}\ y^{4}$

In[ ]:= **Solve[rh5b[[5]] == 0 /. t → 4 / 5]**

Out[ ]= {{y → -1.06 … × 10^4}, {y → -0.831 …}, {y → 0.720 …}, {y → 0.783 …}}

```
In[ • ]:= Expand[rh5b[[5]] - qq45]
Out[ • ]= 0
```