Computations on case 2

Fixed sample sizes in period 1 and 2 with ncc

Set (and simplify) conditions

Note that here we assume r1+r2=1, then r3=0

In[1]:=
```
subst = { r01 -> r1-r11 , r02 -> (1 - r1) - r12 - r22 }
```

Out[1]=
$$\{r01 \to r1 - r11,\ r02 \to 1 - r1 - r12 - r22\}$$

In[2]:=
```
ex = {r1 → 0.4}
```

Out[2]=
$$\{r1 \to 0.4\}$$

Define terms to optimise

Note: *sigma*term1^(-1)/N* is the variance of the estimator of effect 1 (analogously *sigma*term2^(-1)/N* for effect 2). But since sigma and N are fixed, we simply work on term1 and term2 expressions.

In[3]:=
```
term1 = FullSimplify[(r11 * r01 / (r11 + r01)) + (r12 * r02 / (r12 + r02)) /. subst]
```

Out[3]=
$$r11 - \frac{r11^2}{r1} + r12 + \frac{r12^2}{-1 + r1 + r22}$$

In[4]:=
```
term2 = FullSimplify[
   (1 / r22 + 1 / r02 - ((1 / r02) ^ 2 / (1 / r01 + 1 / r02 + 1 / r11 + 1 / r12))) ^ (-1) /. subst]
```

Out[4]=
$$-\frac{\left(-r1^2\ (r11 + r12) + r1\ (r11 + r12)\ (1 + r11 - r12 - r22) + r11^2\ (-1 + r22)\right)\ r22}{r11^2 + r1^2\ (r11 + r12) - r1\ (1 + r11 - r12)\ (r11 + r12)}$$

In[5]:=
```
sol = Solve[term1 == term2, r12][[1]]
```

Out[5]=
$$\left\{r12 \to \frac{1}{2\ r1}\left(r1 - r1^2 - \sqrt{r1}\right.\right.$$
$$\left.\left.\sqrt{r1 - 2\ r1^2 + r1^3 + 4\ r1\ r11 - 4\ r1^2\ r11 - 4\ r11^2 + 4\ r1\ r11^2 - 4\ r1\ r22 + 4\ r1^2\ r22 + 4\ r1\ r22^2}\right)\right\}$$

In[6]:=
```
term3 = FullSimplify[term1 /. sol]
```

Out[6]=
$$\frac{1}{2\ r1\ (-1 + r1 + r22)}\ r22\ \left(r1^2 - 2\ r11^2 + r1\ (-1 + 2\ r11 + 2\ r22) -\right.$$
$$\left.\sqrt{r1}\ \sqrt{(-1 + r1)\ \left((-1 + r1)\ r1 - 4\ r1\ r11 + 4\ r11^2\right) + 4\ (-1 + r1)\ r1\ r22 + 4\ r1\ r22^2}\right)$$

In[7]:=
```
e1 = FullSimplify[D[term3, r22]]
```

Out[7]=
$$\frac{1}{2\,r1\,(-1+r1+r22)^2}\left(r22\,(-1+r1+r22)\left(2\,r1-\frac{2\,r1^{3/2}\,(-1+r1+2\,r22)}{\sqrt{(-1+r1)\left((-1+r1)\,r1-4\,r1\,r11+4\,r11^2\right)+4\,(-1+r1)\,r1\,r22+4\,r1\,r22^2}}\right)-\right.$$
$$r22\left(r1^2-2\,r11^2+r1\,(-1+2\,r11+2\,r22)-\right.$$
$$\left.\sqrt{r1}\,\sqrt{(-1+r1)\left((-1+r1)\,r1-4\,r1\,r11+4\,r11^2\right)+4\,(-1+r1)\,r1\,r22+4\,r1\,r22^2}\right)+$$
$$(-1+r1+r22)\left(r1^2-2\,r11^2+r1\,(-1+2\,r11+2\,r22)-\right.$$
$$\left.\left.\sqrt{r1}\,\sqrt{(-1+r1)\left((-1+r1)\,r1-4\,r1\,r11+4\,r11^2\right)+4\,(-1+r1)\,r1\,r22+4\,r1\,r22^2}\right)\right)$$

In[8]:=
```
e2 = FullSimplify[D[term3, r11]]
```

Out[8]=
$$\frac{r22\left(r1-2\,r11+\frac{(-1+r1)\,\sqrt{r1}\,(r1-2\,r11)}{\sqrt{(-1+r1)\left((-1+r1)\,r1-4\,r1\,r11+4\,r11^2\right)+4\,(-1+r1)\,r1\,r22+4\,r1\,r22^2}}\right)}{r1\,(-1+r1+r22)}$$

In[9]:=
```
sol2 = Solve[{r22 (-1 + r1 + r22)
    (2 r1 - (2 r1^(3/2) (-1 + r1 + 2 r22))/Sqrt[(-1 + r1) ((-1 + r1) r1 - 4 r1 r11 + 4 r11^2) + 4 (-1 + r1) r1 r22 + 4 r1 r22^2]) -
   r22 (r1^2 - 2 r11^2 + r1 (-1 + 2 r11 + 2 r22) -
     Sqrt[r1] Sqrt[(-1 + r1) ((-1 + r1) r1 - 4 r1 r11 + 4 r11^2) + 4 (-1 + r1) r1 r22 + 4 r1 r22^2]) +
   (-1 + r1 + r22) (r1^2 - 2 r11^2 + r1 (-1 + 2 r11 + 2 r22) -
     Sqrt[r1] Sqrt[(-1 + r1) ((-1 + r1) r1 - 4 r1 r11 + 4 r11^2) + 4 (-1 + r1) r1 r22 + 4 r1 r22^2]) ==
  0, r22 (r1 - 2 r11 +
    ((-1 + r1) Sqrt[r1] (r1 - 2 r11))/Sqrt[(-1 + r1) ((-1 + r1) r1 - 4 r1 r11 + 4 r11^2) + 4 (-1 + r1) r1 r22 + 4 r1 r22^2]) ==
  0}, {r11, r22}];
```

Solve: There may be values of the parameters for which some or all solutions are not valid.

The solutions are then the following

In[26]:=
```
sol2[[11]]
```

Out[26]=
$$\left\{r11 \to \frac{r1}{2},\right.$$

$$
\begin{aligned}
r22 \to 1 - r1 + \frac{1}{2}\sqrt{\left(4\,(-1+r1)^2 + \frac{1}{4}\left(-22+43\,r1-21\,r1^2\right) + \frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)} + \right.}\\
\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\right.\\
\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+\right.\\
139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+\right.}\\
3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+\\
232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-\\
264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\\
\left.\left.\left.r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)+\\
\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+\right.\\
391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\\
\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}\\
55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-\\
315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+\\
162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-\\
\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\Bigg)-\\
\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\right.}\\
\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\right.\\
\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+\right.\\
139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+\right.}\\
3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+\\
232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-\\
264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\\
\left.\left.\left.r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)-\\
\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+\right.\\
391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\\
\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}\\
55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-\\
315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+\\
162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-\\
\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}+\\
\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/\\
\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\right.}\right.\\
\left.\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\right.
\end{aligned}
$$

$$\left(3\,(-1+r1)\,\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)\Bigg\}$$

In[24]:= `sol[[1]] /. sol2[[11]][[2]]`

Out[24]=

$$r12\to\frac{1}{2\,r1}\left(r1-r1^2-\sqrt{r1}\,\sqrt{\left(r1-2\,r1^2+r1^3-4\,r1\left(1-r1+\frac{1}{2}\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)-$$

$$\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)-\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}+\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)\right)+$$

$$4\,r1^2\left(1-r1+\frac{1}{2}\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\right.\right.$$
$$\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/$$
$$\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+\right.\right.$$
$$391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$
$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}$$
$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$
$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$
$$\left.\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)+$$
$$\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-\right.$$
$$304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$
$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}$$
$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$
$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$
$$\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\Bigg)-$$
$$\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\right.}$$
$$\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/$$
$$\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+\right.\right.$$
$$391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$
$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}$$
$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$
$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$
$$\left.\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)-$$
$$\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-\right.$$
$$304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$
$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}$$
$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$
$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$
$$\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}+$$
$$\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-\right.$$
$$\left.6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/$$

$$\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)\right)\right)+$$

$$4\,r1\left(1-r1+\frac{1}{2}\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)-$$

$$\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\right.}$$

$$\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/$$

$$\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+\right.\right.$$

$$391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$

$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\right.}$$

$$r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176$$

$$r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968$$

$$\left.\left.\left.r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\right.\right.\right.$$

$$\left.\left.\left.r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)-$$

$$\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-\right.$$

$$304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$

$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}$$

$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$

$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$

$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$

$$\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\Big)^{1/3}+$$

$$\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-\right.$$

$$\left.6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/$$

$$\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\right.}\right.$$

$$\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/$$

$$\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-\right.\right.$$

$$304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-$$

$$34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+\right.}$$

$$3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-$$

$$130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$

$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968$$

$$r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+$$

$$24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-$$

$$\left.\left.47\,775\,744\,r1^{16}\right)\right)^{1/3}\Big)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-\right.$$

$$26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-$$

$$303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-\right.}$$

$$467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+$$

$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$

$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$

$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$

$$5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744$$

$$\left.\left.\left.\left.\left.\left.\mathrm{r1}^{16}\right)\right)^{1/3}\right)\right)\right)\right)^{2} + 4\,\mathrm{r1}\,\mathrm{r11} - 4\,\mathrm{r1}^{2}\,\mathrm{r11} - 4\,\mathrm{r11}^{2} + 4\,\mathrm{r1}\,\mathrm{r11}^{2}))$$

In[23]:= `1 - r1 - sol2[[11]][[2]][[2]] - sol[[1]][[2]] /. sol2[[11]][[2]]`

Out[23]=

$$-\frac{1}{2}\sqrt{\Bigg(}4\,(-1+\mathrm{r1})^{2} + \frac{1}{4}\left(-22+43\,\mathrm{r1}-21\,\mathrm{r1}^{2}\right) + \frac{-22+65\,\mathrm{r1}-64\,\mathrm{r1}^{2}+21\,\mathrm{r1}^{3}}{12\,(-1+\mathrm{r1})} +$$

$$\left(2^{1/3}\left(4-40\,\mathrm{r1}+129\,\mathrm{r1}^{2}-196\,\mathrm{r1}^{3}+154\,\mathrm{r1}^{4}-60\,\mathrm{r1}^{5}+9\,\mathrm{r1}^{6}\right)\right)\Big/$$

$$\Big(3\,(-1+\mathrm{r1})\,\Big(1024-1536\,\mathrm{r1}-26\,112\,\mathrm{r1}^{2}+135\,040\,\mathrm{r1}^{3}-304\,896\,\mathrm{r1}^{4}+391\,296\,\mathrm{r1}^{5}-$$

$$303\,104\,\mathrm{r1}^{6}+139\,392\,\mathrm{r1}^{7}-34\,560\,\mathrm{r1}^{8}+3456\,\mathrm{r1}^{9}+\sqrt{\Big(}28\,311\,552\,\mathrm{r1}-467\,140\,608\,\mathrm{r1}^{2}+$$

$$3\,588\,489\,216\,\mathrm{r1}^{3}-16\,978\,083\,840\,\mathrm{r1}^{4}+55\,228\,760\,064\,\mathrm{r1}^{5}-130\,682\,585\,088\,\mathrm{r1}^{6}+$$

$$232\,168\,882\,176\,\mathrm{r1}^{7}-315\,144\,732\,672\,\mathrm{r1}^{8}+329\,334\,128\,640\,\mathrm{r1}^{9}-264\,790\,867\,968$$

$$\mathrm{r1}^{10}+162\,331\,361\,280\,\mathrm{r1}^{11}-74\,439\,917\,568\,\mathrm{r1}^{12}+24\,680\,595\,456$$

$$\mathrm{r1}^{13}-5\,573\,836\,800\,\mathrm{r1}^{14}+764\,411\,904\,\mathrm{r1}^{15}-47\,775\,744\,\mathrm{r1}^{16}\Big)\Big)^{1/3}\Big)+$$

$$\frac{1}{48\times2^{1/3}\,(-1+\mathrm{r1})}\Big(1024-1536\,\mathrm{r1}-26\,112\,\mathrm{r1}^{2}+135\,040\,\mathrm{r1}^{3}-304\,896\,\mathrm{r1}^{4}+$$

$$391\,296\,\mathrm{r1}^{5}-303\,104\,\mathrm{r1}^{6}+139\,392\,\mathrm{r1}^{7}-34\,560\,\mathrm{r1}^{8}+3456\,\mathrm{r1}^{9}+$$

$$\sqrt{\Big(}28\,311\,552\,\mathrm{r1}-467\,140\,608\,\mathrm{r1}^{2}+3\,588\,489\,216\,\mathrm{r1}^{3}-16\,978\,083\,840\,\mathrm{r1}^{4}+$$

$$55\,228\,760\,064\,\mathrm{r1}^{5}-130\,682\,585\,088\,\mathrm{r1}^{6}+232\,168\,882\,176\,\mathrm{r1}^{7}-315\,144\,732\,672\,\mathrm{r1}^{8}+$$

$$329\,334\,128\,640\,\mathrm{r1}^{9}-264\,790\,867\,968\,\mathrm{r1}^{10}+162\,331\,361\,280\,\mathrm{r1}^{11}-74\,439\,917\,568\,\mathrm{r1}^{12}+$$

$$24\,680\,595\,456\,\mathrm{r1}^{13}-5\,573\,836\,800\,\mathrm{r1}^{14}+764\,411\,904\,\mathrm{r1}^{15}-47\,775\,744\,\mathrm{r1}^{16}\Big)\Big)^{1/3}\Bigg)+$$

$$\frac{1}{2}\sqrt{\Bigg(}8\,(-1+\mathrm{r1})^{2} + \frac{1}{4}\left(-22+43\,\mathrm{r1}-21\,\mathrm{r1}^{2}\right) - \frac{-22+65\,\mathrm{r1}-64\,\mathrm{r1}^{2}+21\,\mathrm{r1}^{3}}{12\,(-1+\mathrm{r1})} -$$

$$\left(2^{1/3}\left(4-40\,\mathrm{r1}+129\,\mathrm{r1}^{2}-196\,\mathrm{r1}^{3}+154\,\mathrm{r1}^{4}-60\,\mathrm{r1}^{5}+9\,\mathrm{r1}^{6}\right)\right)\Big/$$

$$\Big(3\,(-1+\mathrm{r1})\,\Big(1024-1536\,\mathrm{r1}-26\,112\,\mathrm{r1}^{2}+135\,040\,\mathrm{r1}^{3}-304\,896\,\mathrm{r1}^{4}+391\,296\,\mathrm{r1}^{5}-$$

$$303\,104\,\mathrm{r1}^{6}+139\,392\,\mathrm{r1}^{7}-34\,560\,\mathrm{r1}^{8}+3456\,\mathrm{r1}^{9}+\sqrt{\Big(}28\,311\,552\,\mathrm{r1}-467\,140\,608\,\mathrm{r1}^{2}+$$

$$3\,588\,489\,216\,\mathrm{r1}^{3}-16\,978\,083\,840\,\mathrm{r1}^{4}+55\,228\,760\,064\,\mathrm{r1}^{5}-130\,682\,585\,088\,\mathrm{r1}^{6}+$$

$$232\,168\,882\,176\,\mathrm{r1}^{7}-315\,144\,732\,672\,\mathrm{r1}^{8}+329\,334\,128\,640\,\mathrm{r1}^{9}-264\,790\,867\,968$$

$$\mathrm{r1}^{10}+162\,331\,361\,280\,\mathrm{r1}^{11}-74\,439\,917\,568\,\mathrm{r1}^{12}+24\,680\,595\,456$$

$$\mathrm{r1}^{13}-5\,573\,836\,800\,\mathrm{r1}^{14}+764\,411\,904\,\mathrm{r1}^{15}-47\,775\,744\,\mathrm{r1}^{16}\Big)\Big)^{1/3}\Big)-$$

$$\frac{1}{48\times2^{1/3}\,(-1+\mathrm{r1})}\Big(1024-1536\,\mathrm{r1}-26\,112\,\mathrm{r1}^{2}+135\,040\,\mathrm{r1}^{3}-304\,896\,\mathrm{r1}^{4}+$$

$$391\,296\,\mathrm{r1}^{5}-303\,104\,\mathrm{r1}^{6}+139\,392\,\mathrm{r1}^{7}-34\,560\,\mathrm{r1}^{8}+3456\,\mathrm{r1}^{9}+$$

$$\sqrt{\Big(}28\,311\,552\,\mathrm{r1}-467\,140\,608\,\mathrm{r1}^{2}+3\,588\,489\,216\,\mathrm{r1}^{3}-16\,978\,083\,840\,\mathrm{r1}^{4}+$$

$$55\,228\,760\,064\,\mathrm{r1}^{5}-130\,682\,585\,088\,\mathrm{r1}^{6}+232\,168\,882\,176\,\mathrm{r1}^{7}-315\,144\,732\,672\,\mathrm{r1}^{8}+$$

$$329\,334\,128\,640\,\mathrm{r1}^{9}-264\,790\,867\,968\,\mathrm{r1}^{10}+162\,331\,361\,280\,\mathrm{r1}^{11}-74\,439\,917\,568\,\mathrm{r1}^{12}+$$

$$24\,680\,595\,456\,\mathrm{r1}^{13}-5\,573\,836\,800\,\mathrm{r1}^{14}+764\,411\,904\,\mathrm{r1}^{15}-47\,775\,744\,\mathrm{r1}^{16}\Big)\Big)^{1/3}+$$

$$\left(-64\,(-1+\mathrm{r1})^{3}+4\,(-1+\mathrm{r1})\left(22-43\,\mathrm{r1}+21\,\mathrm{r1}^{2}\right)-6\left(-4+11\,\mathrm{r1}-10\,\mathrm{r1}^{2}+3\,\mathrm{r1}^{3}\right)\right)\Big/$$

$$\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)-\frac{1}{2\,r1}\left(r1-r1^2-\sqrt{r1}\sqrt{\left(r1-2\,r1^2+r1^3-4\,r1\left(1-r1+\frac{1}{2}\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)\right)-$$

$$\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)-\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}+\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)\right)\right)}+$$

$$4\,r1^2\left(1-r1+\frac{1}{2}\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}^{1/3}\right)\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}^{1/3}\right)-\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}^{1/3}\right)\right)-\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}^{1/3}+\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/$$

$$\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)\right)\right)\right)+$$

$$4\,r1\left(1-r1+\frac{1}{2}\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)}\right)^{1/3}\right)-$$

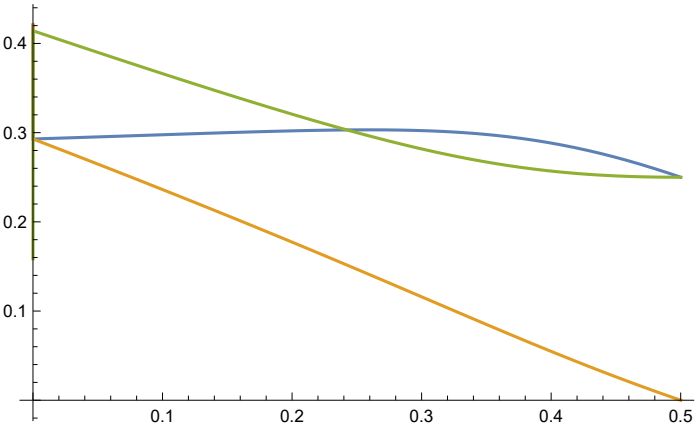
$$\frac{1}{2}\sqrt{\left(8\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)-\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}-\right.}$$
$$\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/$$
$$\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+\right.\right.$$
$$391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$
$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\right.}$$
$$r1^4+55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176$$
$$r1^7-315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968$$
$$r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456$$
$$\left.\left.\left.r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)-$$
$$\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-\right.$$
$$304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+$$
$$\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+\right.}$$
$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$
$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$
$$\left.\left.5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744\,r1^{16}\right)\right)^{1/3}+$$
$$\left(-64\,(-1+r1)^3+4\,(-1+r1)\left(22-43\,r1+21\,r1^2\right)-\right.$$
$$\left.6\left(-4+11\,r1-10\,r1^2+3\,r1^3\right)\right)\Big/$$
$$\left(4\sqrt{\left(4\,(-1+r1)^2+\frac{1}{4}\left(-22+43\,r1-21\,r1^2\right)+\frac{-22+65\,r1-64\,r1^2+21\,r1^3}{12\,(-1+r1)}+\right.\right.}$$
$$\left(2^{1/3}\left(4-40\,r1+129\,r1^2-196\,r1^3+154\,r1^4-60\,r1^5+9\,r1^6\right)\right)\Big/$$
$$\left(3\,(-1+r1)\left(1024-1536\,r1-26\,112\,r1^2+135\,040\,r1^3-\right.\right.$$
$$304\,896\,r1^4+391\,296\,r1^5-303\,104\,r1^6+139\,392\,r1^7-$$
$$34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-467\,140\,608\,r1^2+\right.}$$
$$3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+55\,228\,760\,064\,r1^5-$$
$$130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968$$
$$r1^{10}+162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+$$
$$24\,680\,595\,456\,r1^{13}-5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-$$
$$\left.\left.\left.47\,775\,744\,r1^{16}\right)\right)^{1/3}\right)+\frac{1}{48\times 2^{1/3}\,(-1+r1)}\left(1024-1536\,r1-\right.$$
$$26\,112\,r1^2+135\,040\,r1^3-304\,896\,r1^4+391\,296\,r1^5-$$
$$303\,104\,r1^6+139\,392\,r1^7-34\,560\,r1^8+3456\,r1^9+\sqrt{\left(28\,311\,552\,r1-\right.}$$
$$467\,140\,608\,r1^2+3\,588\,489\,216\,r1^3-16\,978\,083\,840\,r1^4+$$
$$55\,228\,760\,064\,r1^5-130\,682\,585\,088\,r1^6+232\,168\,882\,176\,r1^7-$$
$$315\,144\,732\,672\,r1^8+329\,334\,128\,640\,r1^9-264\,790\,867\,968\,r1^{10}+$$
$$162\,331\,361\,280\,r1^{11}-74\,439\,917\,568\,r1^{12}+24\,680\,595\,456\,r1^{13}-$$
$$5\,573\,836\,800\,r1^{14}+764\,411\,904\,r1^{15}-47\,775\,744$$

$$r1^{16}\Big)\Big)^{1/3}\Big)\Big)\Big)\Big)^2 + 4\,r1\,r11 - 4\,r1^2\,r11 - 4\,r11^2 + 4\,r1\,r11^2\Big)\Big)$$

Plot solutions in period 2 with respect to r1

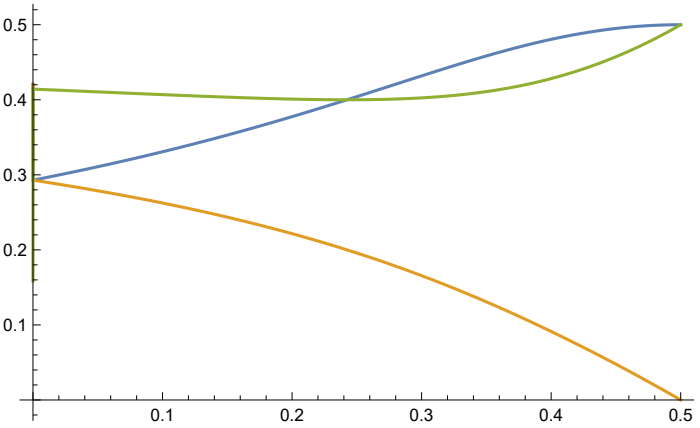
In[ ]:=
```
Plot[{sol2[[11]][[2]][[2]], sol[[1]][[2]] /. sol2[[11]][[2]] /. r11 → r1 / 2,
  1 - r1 - sol2[[11]][[2]][[2]] - sol[[1]][[2]] /. sol2[[11]][[2]] /. r11 → r1 / 2}, {r1, 0, .5}]
```

Out[ ]=



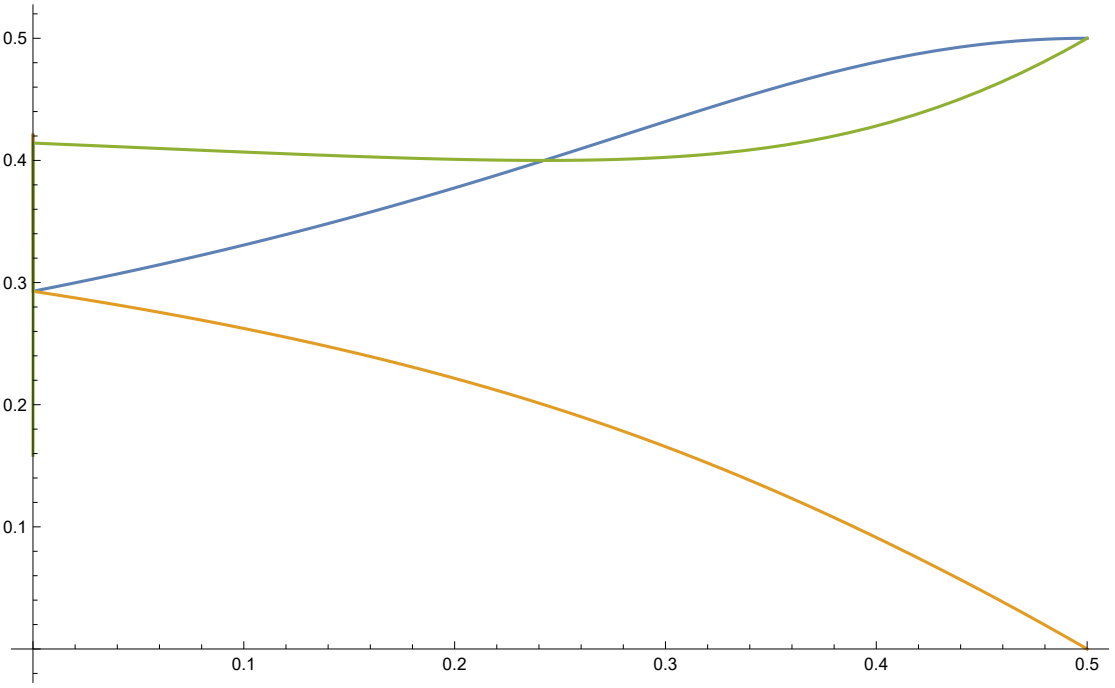
In[ ]:=
```
Plot[{sol2[[11]][[2]][[2]] / (1 - r1),
  (sol[[1]][[2]] /. sol2[[11]][[2]] /. r11 → r1 / 2) / (1 - r1), 1 - sol2[[11]][[2]][[2]] / (1 - r1) -
   (sol[[1]][[2]] /. sol2[[11]][[2]] /. r11 → r1 / 2) / (1 - r1)}, {r1, 0, .5}]
```

Out[ ]=



In[•]:=
```
Show[%222, ImageSize → Large]
```

Out[•]=



Numerical example:

In[•]:=
```
sol2 /. {r1 → 0.1}
```

Out[•]=
```
{{r22 → 0.875048 - 0.110736 i},
 {r22 → 0.875048 + 0.110736 i}, {r22 → 0.297642}, {r22 → 1.55226}}
```

In[•]:=
```
sol /. sol2 /. {r1 → 0.1}
```

Out[•]=
```
{{r12 → 0.00069231 + 0.104757 i},
 {r12 → 0.00069231 - 0.104757 i}, {r12 → 0.236194}, {r12 → -0.662421}}
```

Import solutions to R

```
CForm[sol2[[11]][[2]][[2]];
```

In[•]:=
```
CForm[sol[[1]][[2]]
```

Out[•]//CForm=
```
(r1 - Power(r1,2) - Sqrt(r1)*Sqrt(r1 - 2*Power(r1,2) + Power(r1,3) + 4*r1*r11 - 4*Powe
      4*r1*Power(r22,2)))/(2.*r1)
```