```
restart;
```

Mixed triopoly with a no negative profit constraint and a transfer

```
Q := q[a] + q[b] + q[c];
```

$$Q := q_a + q_b + q_c \tag{1.1}$$

```
P := 1 - Q;
```

$$P := 1 - q_a - q_b - q_c \tag{1.2}$$

```
TC[a] := m·q[a] + F;
```

$$TC_a := m\,q_a + F \tag{1.3}$$

```
TC[b] := m·q[b] + F;
```

$$TC_b := m\,q_b + F \tag{1.4}$$

```
TC[c] := m·q[c] + t·q[c] + F;
```

$$TC_c := m\,q_c + t\,q_c + F \tag{1.5}$$

```
profit[a] := q[a]*P - TC[a];
```

$$profit_a := \left(1 - q_a - q_b - q_c\right) q_a - m\,q_a - F \tag{1.6}$$

```
profit[b] := q[b]*P - TC[b];
```

$$profit_b := \left(1 - q_a - q_b - q_c\right) q_b - m\,q_b - F \tag{1.7}$$

```
profit[c] := q[c]*P - TC[c];
```

$$profit_c := \left(1 - q_a - q_b - q_c\right) q_c - m\,q_c - t\,q_c - F \tag{1.8}$$

```
##SS := Q^2/2 + profit[a] + profit[b] + profit[c] + t·q[c];
SS := factor(Q^2/2 + profit[a] + profit[b] + profit[c] + t·q[c]);
```

$$SS := -\frac{1}{2}\,q_a^2 - q_a\,q_b - q_a\,q_c - \frac{1}{2}\,q_b^2 - q_b\,q_c - \frac{1}{2}\,q_c^2 + q_a - m\,q_a - 3\,F + q_b - m\,q_b + q_c - m\,q_c \tag{1.9}$$

```
P > 0, q[a] > 0, q[b] > 0, q[c] > 0, m > 0;
```

$$0 < 1 - q_a - q_b - q_c,\ 0 < q_a,\ 0 < q_b,\ 0 < q_c,\ 0 < m \tag{1.10}$$

#Reaction functions

```
FOC[q[a]] := diff(profit[a], q[a]);
```

$$FOC_{q_a} := -2\,q_a + 1 - q_b - q_c - m \tag{1.11}$$

```
q[a](q[b], q[c]) := solve(FOC[q[a]], q[a]);
```

$$q_a(q_b, q_c) := \frac{1}{2} - \frac{q_b}{2} - \frac{q_c}{2} - \frac{m}{2} \tag{1.12}$$

```
FOC[q[b]] := diff(profit[b], q[b]);
```

$$FOC_{q_b} := -2\,q_b + 1 - q_a - q_c - m \tag{1.13}$$

$q[b](q[a], q[c]) := solve(\%, q[b]);$

$$q_b(q_a, q_c) := \frac{1}{2} - \frac{q_a}{2} - \frac{q_c}{2} - \frac{m}{2} \tag{1.14}$$

$SS;$

$$-\frac{1}{2} q_a^2 - q_a q_b - q_a q_c - \frac{1}{2} q_b^2 - q_b q_c - \frac{1}{2} q_c^2 + q_a - m q_a - 3 F + q_b - m q_b + q_c - m q_c \tag{1.15}$$

$FOC2[q[c]] := diff(SS, q[c]);$

$$FOC2_{q_c} := -q_a - q_b - q_c + 1 - m \tag{1.16}$$

$FOC[q[c]] := profit[c];$

$$FOC_{q_c} := (1 - q_a - q_b - q_c)\, q_c - m q_c - t q_c - F \tag{1.17}$$

$q[c](q[a], q[b]) := isolate(\%, q[c]);$

$$q_c(q_a, q_b) := q_c = -\frac{m}{2} - \frac{t}{2} - \frac{q_a}{2} - \frac{q_b}{2} + \frac{1}{2} - \frac{1}{2}\left(m^2 + 2 m t + 2 m q_a + 2 m q_b + t^2 + 2 t q_a + 2 t q_b + q_a^2 + 2 q_a q_b + q_b^2 - 4 F - 2 m - 2 t - 2 q_a - 2 q_b + 1\right)^{1/2} \tag{1.18}$$

$q[c] = piecewise(0 < rhs(\%), rhs(\%));$

$$q_c = \begin{cases} -\frac{m}{2} - \frac{t}{2} - \frac{q_a}{2} - \frac{q_b}{2} + \frac{1}{2} - \frac{\sqrt{m^2 + 2 m t + 2 m q_a + 2 m q_b + t^2 + 2 t q_a + 2 t q_b + q_a^2 + 2 q_a q_b + q_b^2}}{2} \\ 0 \end{cases}$$

#Reaction functions in a mixed triopoly, $m = 0, t = 0.2, F = 0.005$

$subs(m = 0, t = 0.2, F = 0.005, (q[a](q[b], q[c]) + q[b](q[a], q[c])));$

$$1 - \frac{q_b}{2} - q_c - \frac{q_a}{2} \tag{1.1.1}$$

$isolate(\%, q[c]);$

$$q_c = 1 - \frac{q_b}{2} - \frac{q_a}{2} \tag{1.1.2}$$

$subs(m = 0, t = 0.2, F = 0.005, (q[c](q[a], q[b])));$

$$q_c = 0.4000000000 - \frac{q_a}{2} - \frac{q_b}{2} - \frac{\sqrt{q_a^2 + 2 q_a q_b + q_b^2 + 0.620 - 1.6 q_a - 1.6 q_b}}{2} \tag{1.1.3}$$

$convert(\%, rational);$

$$q_c = \frac{2}{5} - \frac{q_a}{2} - \frac{q_b}{2} - \frac{\sqrt{q_a^2 + 2\,q_a\,q_b + q_b^2 + \frac{31}{50} - \frac{8}{5}\,q_a - \frac{8}{5}\,q_b}}{2} \tag{1.1.4}$$

simplify(%, sqrt, *symbolic*);

$$q_c = \frac{2}{5} - \frac{q_a}{2} - \frac{q_b}{2} - \frac{\sqrt{100\,q_a^2 + (200\,q_b - 160)\,q_a + 100\,q_b^2 - 160\,q_b + 62}}{20} \tag{1.1.5}$$

factor(%, *method* = "Wang");

$$q_c = \frac{2}{5} - \frac{q_a}{2} - \frac{q_b}{2} - \frac{\sqrt{100\,q_a^2 + 200\,q_a\,q_b + 100\,q_b^2 - 160\,q_a - 160\,q_b + 62}}{20} \tag{1.1.6}$$

$sys := \{FOC[q[a]], FOC[q[b]], FOC[q[c]]\}$;

$$sys := \{(1 - q_a - q_b - q_c)\,q_c - m\,q_c - t\,q_c - F,\ -2\,q_a + 1 - q_b - q_c - m,\ -2\,q_b + 1 - q_a - q_c - m\} \tag{1.20}$$

solve(*sys*, $\{q[a], q[b], q[c]\}$);

$$\left\{q_a = \frac{1}{3} - \frac{RootOf(\_Z^2 + (m + 3\,t - 1)\,\_Z + 3\,F)}{3} - \frac{m}{3},\ q_b = \frac{1}{3} - \frac{RootOf(\_Z^2 + (m + 3\,t - 1)\,\_Z + 3\,F)}{3} - \frac{m}{3},\ q_c = RootOf(\_Z^2 + (m + 3\,t - 1)\,\_Z + 3\,F)\right\} \tag{1.21}$$

convert(%, *radical*);

$$\left\{q_a = \frac{1}{6} - \frac{m}{6} + \frac{t}{2} - \frac{\sqrt{m^2 + 6\,m\,t + 9\,t^2 - 12\,F - 2\,m - 6\,t + 1}}{6},\ q_b = \frac{1}{6} - \frac{m}{6} + \frac{t}{2} - \frac{\sqrt{m^2 + 6\,m\,t + 9\,t^2 - 12\,F - 2\,m - 6\,t + 1}}{6},\ q_c = -\frac{m}{2} - \frac{3\,t}{2} + \frac{1}{2} + \frac{\sqrt{m^2 + 6\,m\,t + 9\,t^2 - 12\,F - 2\,m - 6\,t + 1}}{2}\right\} \tag{1.22}$$

$qastar := rhs(\%[1])$;

$$qastar := \frac{1}{6} - \frac{m}{6} + \frac{t}{2} - \frac{\sqrt{m^2 + 6\,m\,t + 9\,t^2 - 12\,F - 2\,m - 6\,t + 1}}{6} \tag{1.23}$$

$qbstar := rhs(\%\%[2])$;

$$qbstar := \frac{1}{6} - \frac{m}{6} + \frac{t}{2} - \frac{\sqrt{m^2 + 6\,m\,t + 9\,t^2 - 12\,F - 2\,m - 6\,t + 1}}{6} \tag{1.24}$$

$qcstar := rhs(\%\%\%[3])$;

$$qcstar := -\frac{m}{2} - \frac{3\,t}{2} + \frac{1}{2} + \frac{\sqrt{m^2 + 6\,m\,t + 9\,t^2 - 12\,F - 2\,m - 6\,t + 1}}{2} \tag{1.25}$$

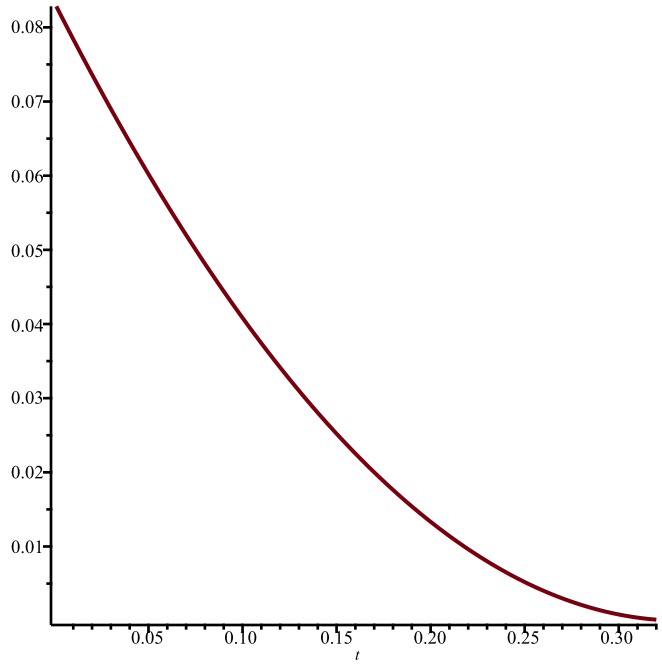
$(1 - 3\,t)^2 - 12\,F = 0$;

$$(1-3t)^2-12F=0 \tag{1.26}$$

$solve(\%, F);$

$$\frac{(-1+3t)^2}{12} \tag{1.27}$$

$plot(\%, t=0.001 \,..\, 0.32)$



$Qstarsmixed000 := subs(q[a]=(qastar), q[b]=(qbstar), q[c]=(qcstar), m=0, t=0, F=0, Q);$

$$Qstarsmixed000 := 1 \tag{1.28}$$

$Qstarsmixed := subs(q[a]=(qastar), q[b]=(qbstar), q[c]=(qcstar), Q);$

$$Qstarsmixed := \frac{5}{6}-\frac{5m}{6}-\frac{t}{2}+\frac{\sqrt{m^2+6mt+9t^2-12F-2m-6t+1}}{6} \tag{1.29}$$

$CS := \frac{(\%)^2}{2}+qcstar\cdot t;$

$$CS := \frac{\left(\frac{5}{6}-\frac{5m}{6}-\frac{t}{2}+\frac{\sqrt{m^2+6mt+9t^2-12F-2m-6t+1}}{6}\right)^2}{2}+\left(-\frac{m}{2}-\frac{3t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6mt+9t^2-12F-2m-6t+1}}{2}\right)t \tag{1.30}$$

$simplify(\%, \text{sqrt}, symbolic);$

$$\frac{(-5m+15t+5)\sqrt{m^2+(6t-2)m+9t^2-12F-6t+1}}{36}+\frac{13m^2}{36}-\frac{5t^2}{4}-\frac{F}{6}-\frac{13m}{18}+\frac{13}{36} \tag{1.31}$$

$Pfinal := subs(q[a]=(qastar), q[b]=(qbstar), q[c]=(qcstar), P);$

$$Pfinal := \frac{1}{6}+\frac{5m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+6mt+9t^2-12F-2m-6t+1}}{6} \tag{1.32}$$

simplify(%, sqrt, symbolic);

$$\frac{1}{6}+\frac{5\,m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+(6\,t-2)\,m+9\,t^2-12\,F-6\,t+1}}{6} \tag{1.33}$$

profitafinal := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), profit[a]);

$$\begin{aligned} profitafinal := {} & \left(\frac{1}{6}+\frac{5\,m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)\left(\frac{1}{6}-\frac{m}{6}\right. \\ & \left.+\frac{t}{2}-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)-m\left(\frac{1}{6}-\frac{m}{6}+\frac{t}{2}\right. \\ & \left.-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)-F \end{aligned} \tag{1.34}$$

simplify(%, sqrt, symbolic);

$$\frac{(m-3\,t-1)\,\sqrt{m^2+(6\,t-2)\,m+9\,t^2-12\,F-6\,t+1}}{18}+\frac{m^2}{18}+\frac{t^2}{2}-\frac{4\,F}{3}-\frac{m}{9}+\frac{1}{18} \tag{1.35}$$

subs(m = 0, %)

$$\frac{(-1-3\,t)\,\sqrt{9\,t^2-12\,F-6\,t+1}}{18}+\frac{1}{18}+\frac{t^2}{2}-\frac{4\,F}{3} \tag{1.36}$$

profitcfinal := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), profit[c]);

$$\begin{aligned} profitcfinal := {} & \left(\frac{1}{6}+\frac{5\,m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)\left(-\frac{m}{2}\right. \\ & \left.-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)-m\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}\right. \\ & \left.+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)-\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}\right. \\ & \left.+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)t-F \end{aligned} \tag{1.37}$$

simplify(%, sqrt, symbolic);

$$0 \tag{1.38}$$

Overallprofitfinal := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), (profit[a] + profit[b] + profit[c]));

$$\begin{aligned} Overallprofitfinal := {} & 2\left(\frac{1}{6}+\frac{5\,m}{6}+\frac{t}{2}\right. \\ & \left.-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)\left(\frac{1}{6}-\frac{m}{6}+\frac{t}{2}\right. \\ & \left.-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)-2\,m\left(\frac{1}{6}-\frac{m}{6}+\frac{t}{2}\right. \\ & \left.-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)-3\,F+\left(\frac{1}{6}+\frac{5\,m}{6}+\frac{t}{2}\right. \end{aligned} \tag{1.39}$$

$$-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\Bigg)\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)-m\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)-\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)t$$

simplify(%, sqrt, *symbolic*);

$$\frac{(m-3\,t-1)\sqrt{m^2+(6\,t-2)\,m+9\,t^2-12\,F-6\,t+1}}{9}+\frac{m^2}{9}+t^2-\frac{8\,F}{3}-\frac{2\,m}{9}+\frac{1}{9} \quad \textbf{(1.40)}$$

subs($m=0$, %)

$$\frac{(-1-3\,t)\sqrt{9\,t^2-12\,F-6\,t+1}}{9}+\frac{1}{9}+t^2-\frac{8\,F}{3} \quad \textbf{(1.41)}$$

#*subs*($m=0$, $t=0.2$, $F=0.005$, *qastar*);
Qstarsmixm := *subs*($q[a]=(qastar)$, $q[b]=(qbstar)$, $q[c]=(qcstar)$, Q);

$$Qstarsmixm := \frac{5}{6}-\frac{5\,m}{6}-\frac{t}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6} \quad \textbf{(1.42)}$$

Qprivatestarsmixm := *subs*($q[a]=(qastar)$, $q[b]=(qbstar)$, $q[c]=(qcstar)$, $F=0$, $Q-q[c]$);

$$Qprivatestarsmixm := \frac{1}{3}-\frac{m}{3}+t-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-2\,m-6\,t+1}}{3} \quad \textbf{(1.43)}$$

Qpublicstarsmixm := *subs*($q[a]=(qastar)$, $q[b]=(qbstar)$, $q[c]=(qcstar)$, $F=0$, $q[c]$);

$$Qpublicstarsmixm := -\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-2\,m-6\,t+1}}{2} \quad \textbf{(1.44)}$$

Qstarsmix := *subs*($q[a]=(qastar)$, $q[b]=(qbstar)$, $q[c]=(qcstar)$, $m=0.1$, $F=0$, Q);

$$Qstarsmix := 0.7500000000-\frac{t}{2}+\frac{\sqrt{9\,t^2+0.81-5.4\,t}}{6} \quad \textbf{(1.45)}$$

$\% = \frac{2}{3}$;

$$0.7500000000-\frac{t}{2}+\frac{\sqrt{9\,t^2+0.81-5.4\,t}}{6}=\frac{2}{3} \quad \textbf{(1.46)}$$

isolate(%, t);

$$t=0.2333333333 \quad \textbf{(1.47)}$$

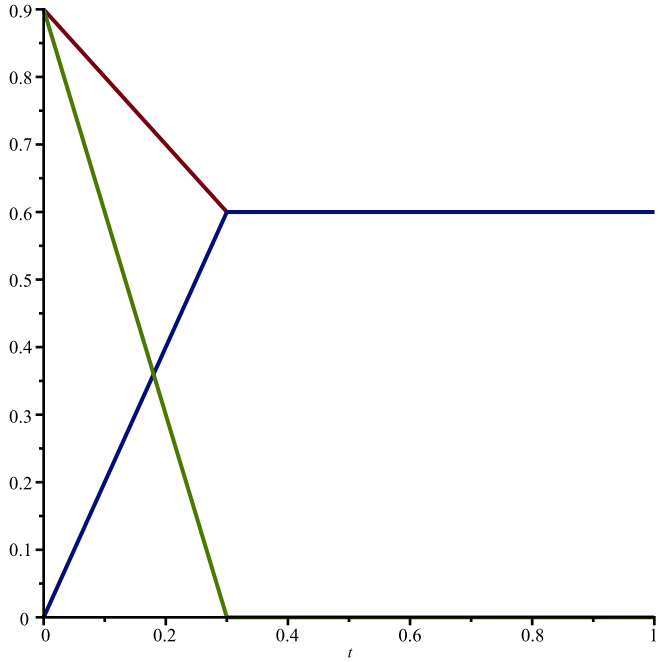
Qprivatestarsmix := *subs*($q[a]=(qastar)$, $q[b]=(qbstar)$, $q[c]=(qcstar)$, $m=0.1$, $F=0$, $Q-q[c]$);

$$Qprivatestarsmix := 0.3000000000+t-\frac{\sqrt{9\,t^2+0.81-5.4\,t}}{3} \quad \textbf{(1.48)}$$

$Qpublicstarsmix := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), m = 0.1, F = 0, q[c]);$

$$Qpublicstarsmix := 0.4500000000 - \frac{3\,t}{2} + \frac{\sqrt{9\,t^2 + 0.81 - 5.4\,t}}{2} \tag{1.49}$$

$plot([Qstarsmix, Qprivatestarsmix, Qpublicstarsmix], t = 0 .. 1);$



$Qstarsmixzero := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), m = 0, F = 0, Q);$

$$Qstarsmixzero := \frac{5}{6} - \frac{t}{2} + \frac{\sqrt{9\,t^2 - 6\,t + 1}}{6} \tag{1.50}$$

$\% = \frac{2}{3};$

$$\frac{5}{6} - \frac{t}{2} + \frac{\sqrt{9\,t^2 - 6\,t + 1}}{6} = \frac{2}{3} \tag{1.51}$$

$solve(\%, t);$

$$RootOf\left(-1 + 3\,\_Z - \sqrt{(-1 + 3\,\_Z)^2}\right) \tag{1.52}$$

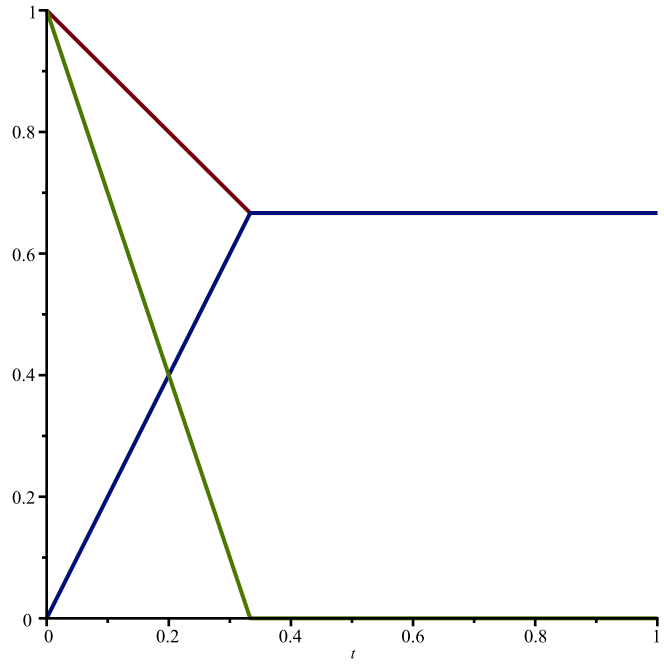
$Qprivatestarsmixzero := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), m = 0, F = 0, Q - q[c]);$

$$Qprivatestarsmixzero := \frac{1}{3} + t - \frac{\sqrt{9\,t^2 - 6\,t + 1}}{3} \tag{1.53}$$

$Qpublicstarsmixzero := subs(q[a] = (qastar), q[b] = (qbstar), q[c] = (qcstar), m = 0, F = 0, q[c]);$

$$Qpublicstarsmixzero := \frac{1}{2} - \frac{3\,t}{2} + \frac{\sqrt{9\,t^2 - 6\,t + 1}}{2} \tag{1.54}$$

$plot([Qstarsmixzero, Qprivatestarsmixzero, Qpublicstarsmixzero], t = 0 .. 1);$




```
#evala(Simplify(%));
subs(q[a]=qastar, q[b]=qbstar, q[c]=qcstar, SS);
```

$$-2\left(\frac{1}{6}-\frac{m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)^2-2\left(\frac{1}{6}-\frac{m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)-\frac{\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right)^2}{2}+\frac{5}{6}-\frac{5\,m}{6}-\frac{t}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}-2\,m\left(\frac{1}{6}-\frac{m}{6}+\frac{t}{2}-\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{6}\right)-3\,F-m\left(-\frac{m}{2}-\frac{3\,t}{2}+\frac{1}{2}+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{2}\right) \tag{1.55}$$

```
SSstar := evala(Simplify(%));
```

$$SSstar := -\frac{17\,F}{6}-\frac{17\,m}{18}+\frac{17\,m^2}{36}-\frac{t^2}{4}-\frac{m\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{36}+\frac{t\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{12}+\frac{17}{36} \tag{1.56}$$

$$+\frac{\sqrt{m^2+6\,m\,t+9\,t^2-12\,F-2\,m-6\,t+1}}{36}$$

simplify(%, sqrt, *symbolic*);

$$\frac{(-m+3\,t+1)\sqrt{m^2+(6\,t-2)\,m+9\,t^2-12\,F-6\,t+1}}{36}+\frac{17\,m^2}{36}-\frac{t^2}{4}-\frac{17\,F}{6}-\frac{17\,m}{18}+\frac{17}{36} \tag{1.57}$$

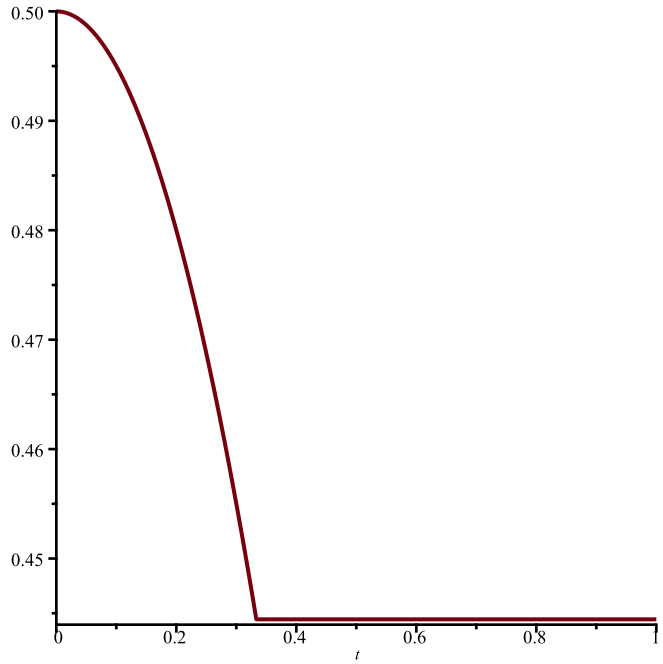
SSstar00 := *subs*(*q*[*a*] = (*qastar*), *q*[*b*] = (*qbstar*), *q*[*c*] = (*qcstar*), *m* = 0, *SSstar*);

$$SSstar00 := -\frac{17\,F}{6}+\frac{17}{36}-\frac{t^2}{4}+\frac{t\sqrt{9\,t^2-12\,F-6\,t+1}}{12}+\frac{\sqrt{9\,t^2-12\,F-6\,t+1}}{36} \tag{1.58}$$

SSstar000 := *subs*(*q*[*a*] = (*qastar*), *q*[*b*] = (*qbstar*), *q*[*c*] = (*qcstar*), *m* = 0, *F* = 0, *SSstar*);

$$SSstar000 := \frac{17}{36}-\frac{t^2}{4}+\frac{t\sqrt{9\,t^2-6\,t+1}}{12}+\frac{\sqrt{9\,t^2-6\,t+1}}{36} \tag{1.59}$$

plot(*SSstar000*, *t* = 0 ..1);



SSstar00 = $\frac{15}{32}-3\,F$;

$$-\frac{17\,F}{6}+\frac{17}{36}-\frac{t^2}{4}+\frac{t\sqrt{9\,t^2-12\,F-6\,t+1}}{12}+\frac{\sqrt{9\,t^2-12\,F-6\,t+1}}{36}=\frac{15}{32}-3\,F \tag{1.60}$$

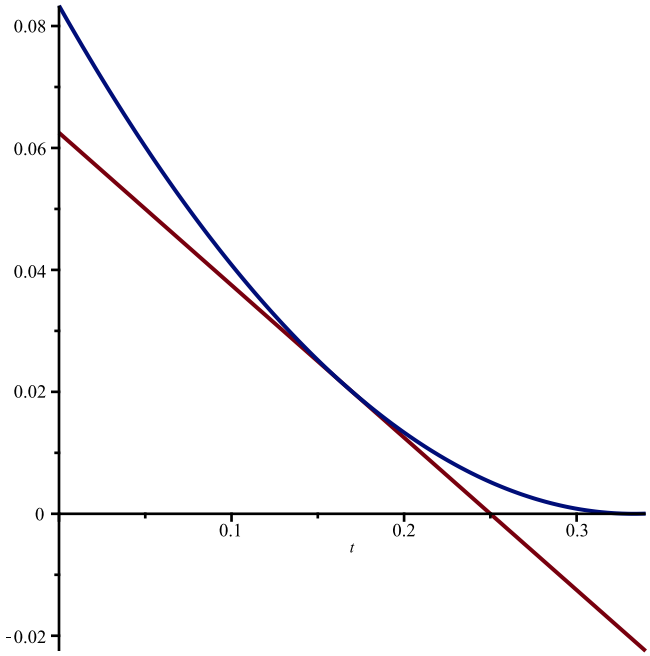
solve(%, *t*);

$$-4\,F+\frac{1}{4},\ -\frac{4\,F}{7}-\frac{1}{4} \tag{1.61}$$

solve(%%, *F*);

$$-\frac{7\,t}{4}-\frac{7}{16},\ -\frac{t}{4}+\frac{1}{16} \tag{1.62}$$

plot$\left(\left[\%[2],\ \frac{(1-3\,t)^2}{12}\right], t = 0.0\ ..0.34\right)$;



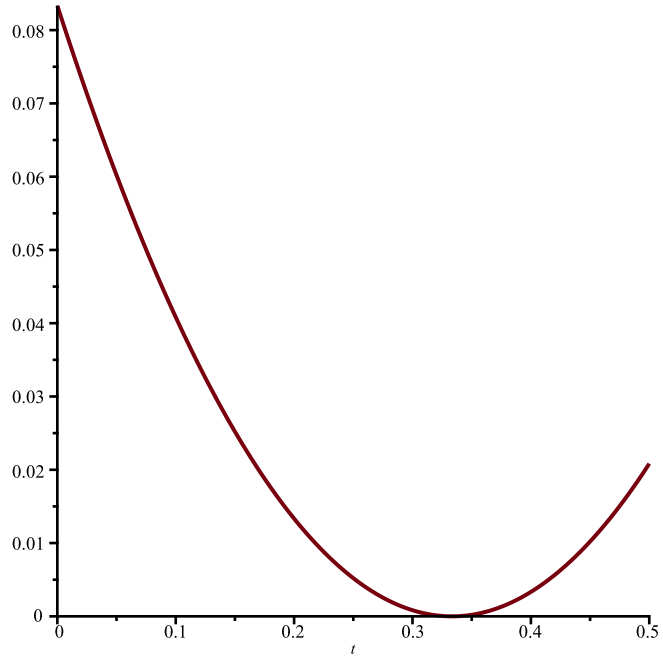
$(1-3\,t)^2-12\,F=0;$

$$(1-3\,t)^2-12\,F=0 \tag{1.63}$$

$solve(\%, F);$

$$\frac{(-1+3\,t)^2}{12} \tag{1.64}$$

$plot(\%, t=0\ ..\ 0.5)$



$SSstar00=\frac{4}{9}-2\,F;$

$$-\frac{17\,F}{6}+\frac{17}{36}-\frac{t^2}{4}+\frac{t\sqrt{9\,t^2-12\,F-6\,t+1}}{12}+\frac{\sqrt{9\,t^2-12\,F-6\,t+1}}{36}=\frac{4}{9}-2\,F \tag{1.65}$$

$solve(\%, t);$

$$-\frac{1}{18}+\frac{5\sqrt{1-18F}}{18},\ -\frac{1}{18}-\frac{5\sqrt{1-18F}}{18} \tag{1.66}$$

$solve(\%\%, F);$

$$-\frac{18}{25}t^2-\frac{2}{25}t+\frac{4}{75},\ 0 \tag{1.67}$$

$plot\left(\left[\%[1],\ \frac{(1-3t)^2}{12}\right], t=0.0..0.34\right);$