Optimale overbrengingsverhouding

Parameters:

```
> r_wiel:= 0.06:
> rho_lucht:= 1.293:
> A:=20*10^(-4):
> Wc:= 0.5:

> om_max:= 17000*2*evalf(Pi)/60:
> T_max:= 18*10^(-3);



> with(plots,implicitplot):
```

vergelijkingen:

```
> F_motor:= (overbr/r_wiel)*(T_max - (T_max*overbr*diff(x(t),t))/
  (om_max*r_wiel));
> R_rol:= mu*m_tot*g;
> R_lucht:= (1/2)*rho_lucht*(diff(x(t),t))^2*A*Wc;



> vgl:= F_motor - R_rol - R_lucht = m*(diff(x(t),t$2));
```

$$T\_max := \frac{9}{500}$$

$$F\_motor := 16.66666667\ overbr\left(\frac{9}{500} - 0.0001685169985\ overbr\left(\frac{d}{dt}x(t)\right)\right)$$

$$R\_rol := 0.3284329206$$

$$R\_lucht := 0.0006465000000\left(\frac{d}{dt}x(t)\right)^2$$

$$vgl := 16.66666667\ overbr\left(\frac{9}{500} - 0.0001685169985\ overbr\left(\frac{d}{dt}x(t)\right)\right) - 0.3284329206 - 0.0006465000000\left(\frac{d}{dt}x(t)\right)^2 = 0.266\left(\frac{d^2}{dt^2}x(t)\right) \quad \textbf{(1.1)}$$

```
> opldiff := dsolve({vgl, x(0) = 0, D(x)(0) = 0});
```

$$opldiff := x(t) = -\frac{561723328445677999}{258600000000000000}\ t\ overbr^2 - \frac{1}{258600000000000000}\ t\ (3155330977200910418279502227926440 01\ overbr^4 + 3103200000620640000000000000000000000\ overbr \quad \textbf{(1.2)}$$

$$-339731013068640000000000000000000000000)^{1/2}$$

$$-\frac{266000}{1293}\ln\left((4\,(31553309772009104182795022279264400 1\ overbr^4$$

$$+310320000062064000000000000000000000000\ overbr$$

$$-339731013068640000000000000000000000000))\Big/$$

$$\left(561723328445677999\right.$$

$$e^{\frac{1}{53200000000000000000}\ t\,(31553309772009104182795022279264400 1\ overbr^4}$$

$$+310320000062064000000000000000000000000\ overbr-339731013068640000000000000000000000000)$$

$$^{1/2}$$

$$overbr^2$$

$$+(31553309772009104182795022279264400 1\ overbr^4$$

$$+310320000062064000000000000000000000000\ overbr$$

$$-339731013068640000000000000000000000000)$$

$$^{1/2}$$

$$e^{\frac{1}{53200000000000000000}\ t\,(31553309772009104182795022279264400 1\ overbr^4}$$

$$+310320000062064000000000000000000000000\ overbr-339731013068640000000000000000000000000)^{1/2}$$

$$-561723328445677999\ overbr^2$$

$$+(31553309772009104182795022279264400 1\ overbr^4$$

$$+310320000062064000000000000000000000000\ overbr$$

$$-339731013068640000000000000000000000000)^{1/2})^2\Big)$$

```
> def:=subs(x(t)=2.5,opldiff);
```

(1.3)

$$def := 2.5 = -\frac{561723328445677999}{258600000000000000}\, t\, overbr^2 \tag{1.3}$$

$$-\frac{1}{258600000000000000}\, t\, (31553309772009104182795022279264400 1\, overbr^4 + 310320000062064000000000000000000000000\, overbr - 339731013068640000000000000000000000000)^{1/2}$$

$$-\frac{266000}{1293}\ln\left(\left(4\,(31553309772009104182795022279264400 1\, overbr^4 + 310320000062064000000000000000000000000\, overbr - 339731013068640000000000000000000000000)\right)\Big/\left(561723328445677999\, e^{\frac{1}{53200000000000000000}\, t\, (31553309772009104182795022279264400 1\, overbr^4 + 310320000062064000000000000000000000000\, overbr - 339731013068640000000000000000000000000)^{1/2}}\, overbr^2 + (31553309772009104182795022279264400 1\, overbr^4 + 310320000062064000000000000000000000000\, overbr - 339731013068640000000000000000000000000)^{1/2} - 561723328445677999\, overbr^2 + (31553309772009104182795022279264400 1\, overbr^4\right.$$

$$+ 3103200000620640000000000000000000000\ overbr$$

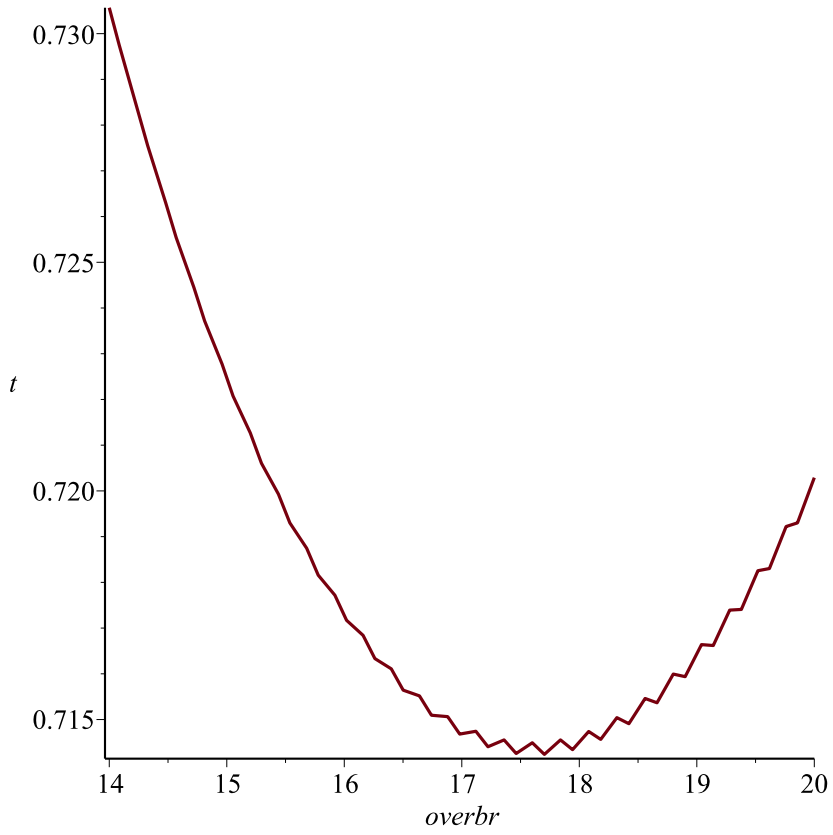
$$- 339731013068640000000000000000000000)^{1/2})^{2})$$

```
> x(t) := -(561723328445677999/258600000000000000)*t*overbr^2-
  (1/258600000000000000)*t*sqrt
  (315533097720091041827950222792644001*
  overbr^4+3103200000620640000000000000000000000*
  overbr-339731013068640000000000000000000000)-(266000/1293)*ln
  ((4*(315533097720091041827950222792644001*
  overbr^4+3103200000620640000000000000000000000*
  overbr-339731013068640000000000000000000000))/
  (561723328445677999*exp((1/532000000000000000)*t*sqrt
  (315533097720091041827950222792644001*
  overbr^4+3103200000620640000000000000000000000*
  overbr-339731013068640000000000000000000000))*overbr^2+sqrt
  (315533097720091041827950222792644001*
  overbr^4+3103200000620640000000000000000000000*
  overbr-339731013068640000000000000000000000)*exp(
  (1/532000000000000000)*t*sqrt
  (315533097720091041827950222792644001*
  overbr^4+3103200000620640000000000000000000000*
  overbr-339731013068640000000000000000000000))
  -561723328445677999*overbr^2+sqrt
  (315533097720091041827950222792644001*
  overbr^4+3103200000620640000000000000000000000*
  overbr-339731013068640000000000000000000000))^2)
  solve(test = 2.5, t);
  test2:=subs(overbr = 18, test2):
  solve(test2 = 2.5, t);
```

$$0.7168402849 + 0.\,I,\ -0.4174599216 + 0.\,I$$

$$-0.3977490059,\ 0.7163081200 + 0.\,I \qquad \textbf{(1.4)}$$

```
> implicitplot(def,overbr=14..20, t=0..5);
```


0.730
0.725
0.720
0.715
t
14
15
16
17
18
19
20
overbr