```
> restart : with(LinearAlgebra) : with(plots) : with(plottools) : with(inttrans) :
      with(VectorCalculus) : SetCoordinates('cartesian'[x, y, z]) :
> #i
> ode := diff(M(t), t$2) = 0.011·diff(M(t), t$1) − 0.00011·M(t) :
> conditions := M(0) = 3000, D(M)(0) = 15 :
> sol := dsolve({ode, conditions})
```

$$sol := M(t) = -\frac{3000\, e^{\frac{11\,t}{2000}} \left(\sqrt{319}\, \sin\left(\frac{\sqrt{319}\, t}{2000} \right) - 319 \cos\left(\frac{\sqrt{319}\, t}{2000} \right) \right)}{319} \tag{1}$$

```
> evalf(solve(rhs(sol) = 0, t))
```

$$169.6323664 \tag{2}$$

```
> # So 169 days
>
> # ii
>  ode := diff(M(t), t$2) = 0.011·diff(M(t), t$1) − 0.00011·M(t) :
> conditions := M(0) = 3000, D(M)(0) = 30 − k :
> sol := dsolve({ode, conditions})
```

$$sol := M(t) = -\frac{2000 \left(\sqrt{319} \left(-\frac{27}{2} + k \right) \sin\left(\frac{\sqrt{319}\, t}{2000} \right) - \frac{957 \cos\left(\frac{\sqrt{319}\, t}{2000} \right)}{2} \right) e^{\frac{11\,t}{2000}}}{319} \tag{3}$$

```
> subs_sol := subs(t = 100, rhs(sol))
```

$$subs\_sol := -\frac{2000 \left(\sqrt{319} \left(-\frac{27}{2} + k \right) \sin\left(\frac{\sqrt{319}}{20} \right) - \frac{957 \cos\left(\frac{\sqrt{319}}{20} \right)}{2} \right) e^{\frac{11}{20}}}{319} \tag{4}$$

```
> evalf(solve(subs_sol, k))
```

$$35.06599836 \tag{5}$$

```
> # So 36 days (took the upper bound)
>
```