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> restart :
PROBLEMA NO LINEAL DEL MATERIAL ANTI BALAS
> Ecuacion := diff(v(t), t) = -K·v(t)·2;
      Ecuacion :=  $\frac{d}{dt} v(t) = -K v(t)^2$  (1)
> with(DEtools) :
> odeadvisor(Ecuacion);
      [_quadrature] (2)
> SolucionGeneral := dsolve(Ecuacion);
      SolucionGeneral :=  $v(t) = \frac{1}{K t + \_CI}$  (3)
> CondicionInicial := v(0) = 200;
      CondicionInicial :=  $v(0) = 200$  (4)
> SolucionParticular := dsolve( {Ecuacion, CondicionInicial} );
      SolucionParticular :=  $v(t) = \frac{200}{1 + 200 K t}$  (5)
> NuevaEcuacion := diff(x(t), t) = rhs(SolucionParticular);
      NuevaEcuacion :=  $\frac{d}{dt} x(t) = \frac{200}{1 + 200 K t}$  (6)
> NuevaCondicion := x(0) = 0;
      NuevaCondicion :=  $x(0) = 0$  (7)
> NuevaSolucionParticular := dsolve( {NuevaEcuacion, NuevaCondicion} );
      NuevaSolucionParticular :=  $x(t) = \frac{\ln(1 + 200 K t)}{K}$  (8)
> EcuacionTiempo := rhs(NuevaSolucionParticular) =  $\frac{1}{10}$ ;
      EcuacionTiempo :=  $\frac{\ln(1 + 200 K t)}{K} = \frac{1}{10}$  (9)
> TiempoSalida := solve(EcuacionTiempo, t);
      TiempoSalida :=  $\frac{1}{200} \frac{e^{\frac{1}{10} K} - 1}{K}$  (10)
> SolucionParticular,
       $v(t) = \frac{200}{1 + 200 K t}$  (11)
> EcuacionSalida := subs(t = TiempoSalida, rhs(SolucionParticular)) = 10;
      EcuacionSalida :=  $\frac{200}{e^{\frac{1}{10} K}} = 10$  (12)
> Parametro := isolate(EcuacionSalida, K); evalf(%, 3);
      Parametro :=  $K = 10 \ln(20)$ 
       $K = 30.0$  (13)
> SolucionFinal := subs(K = rhs(Parametro), SolucionParticular);
      (14)

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$$\text{SolucionFinal} := v(t) = \frac{200}{1 + 2000 \ln(20) t} \quad (14)$$

$$\begin{aligned} &> \text{TrayectoriaFinal} := \text{subs}(K = \text{rhs}(\text{Parametro}), \text{NuevaSolucionParticular}); \\ &\text{TrayectoriaFinal} := x(t) = \frac{1}{10} \frac{\ln(1 + 2000 \ln(20) t)}{\ln(20)} \end{aligned} \quad (15)$$

$$\begin{aligned} &> \text{TiempoSalidaInicial} := \text{subs}(K = \text{rhs}(\text{Parametro}), \text{TiempoSalida}); \text{evalf}(\%, 3); \\ &\text{TiempoSalidaInicial} := \frac{1}{2000} \frac{e^{\ln(20)} - 1}{\ln(20)} \\ &0.00316 \end{aligned} \quad (16)$$

$$\begin{aligned} &> \text{TiempoExtraSalida} := \text{solve}(\text{rhs}(\text{SolucionFinal}) = 5, t); \text{evalf}(\%, 3); \\ &\text{TiempoExtraSalida} := \frac{39}{2000 \ln(20)} \\ &0.00649 \end{aligned} \quad (17)$$

$$\begin{aligned} &> \text{GruesoTotalExtra} := \text{subs}(t = \text{TiempoExtraSalida}, \text{rhs}(\text{TrayectoriaFinal})); \text{evalf}(\%, 3); \\ &\text{GruesoTotalExtra} := \frac{1}{10} \frac{\ln(40)}{\ln(20)} \\ &0.123 \end{aligned} \quad (18)$$

$$\begin{aligned} &> \text{TiempoSuperExtra} := \text{solve}\left(\text{rhs}(\text{TrayectoriaFinal}) = \frac{5}{100}, t\right); \text{evalf}(\%, 3); \\ &\text{TiempoSuperExtra} := \frac{1}{2000} \frac{2\sqrt{5} - 1}{\ln(20)} \\ &0.000580 \end{aligned} \quad (19)$$

$$\begin{aligned} &> \text{VelocidadMayor} := \text{subs}(t = \text{TiempoSuperExtra}, \text{rhs}(\text{SolucionFinal})); \text{evalf}(\%, 3); \\ &\text{VelocidadMayor} := 20 \sqrt{5} \\ &44.8 \end{aligned} \quad (20)$$

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