

> restart

> EcuacionDinamica := Masa·diff(s(t), t\$2) = -Hooke·s(t)

$$EcuacionDinamica := Masa \left(\frac{d^2}{dt^2} s(t) \right) = -Hooke s(t) \quad (1)$$

> CondicionesIniciales := s(0) = - (620 - 203) / 1000, D(s)(0) = 0;

$$CondicionesIniciales := s(0) = - \frac{417}{1000}, D(s)(0) = 0 \quad (2)$$

> gravedad := 981 / 100; Masa := (16 / 1000) / gravedad; Hooke := (1914 / 100) / (5 / 10)

$$gravedad := \frac{981}{100}$$

$$Masa := \frac{8}{4905}$$

$$Hooke := \frac{957}{25} \quad (3)$$

> EcuacionDinamica; evalf(%, 3)

$$\frac{8}{4905} \frac{d^2}{dt^2} s(t) = - \frac{957}{25} s(t)$$

$$0.00163 \left(\frac{d^2}{dt^2} s(t) \right) = -38.3 s(t) \quad (4)$$

> Solucion := dsolve({EcuacionDinamica, CondicionesIniciales}); evalf(%, 5)

$$Solucion := s(t) = - \frac{417}{1000} \cos\left(\frac{3}{20} \sqrt{1043130} t\right)$$

$$s(t) = -0.41700 \cos(153.20 t) \quad (5)$$

> TiempoEscape := solve(rhs(Solucion) = 0, t); evalf(%, 5)

$$TiempoEscape := \frac{1}{312939} \pi \sqrt{1043130}$$

$$0.010253 \quad (6)$$

> DerSolucion := diff(Solucion, t); evalf(%, 5)

$$DerSolucion := \frac{d}{dt} s(t) = \frac{1251}{20000} \sin\left(\frac{3}{20} \sqrt{1043130} t\right) \sqrt{1043130}$$

$$\frac{d}{dt} s(t) = 63.882 \sin(153.20 t) \quad (7)$$

> VelocidadInicial := subs(t = TiempoEscape, rhs(DerSolucion)); evalf(%, 5);
evalf(%%, 5)·3600 / 1000;

$$VelocidadInicial := \frac{1251}{20000} \sin\left(\frac{1}{2} \pi\right) \sqrt{1043130}$$

$$63.882 \\ 229.9752000 \quad (8)$$

TIRO PARABOLICO

$$\begin{aligned} > \text{EcuacionVertical} := \text{diff}(y(t), t^2) = -\text{gravedad}; \text{EcuacionHorizontal} := \text{diff}(x(t), t) \\ &= \text{VelocidadInicial} \cdot \cos\left(\frac{\text{Pi}}{4}\right) \end{aligned}$$

$$\text{EcuacionVertical} := \frac{d^2}{dt^2} y(t) = -\frac{981}{100}$$

$$\text{EcuacionHorizontal} := \frac{d}{dt} x(t) = \frac{1251}{40000} \sqrt{1043130} \sqrt{2} \quad (9)$$

$$> \text{CondicionesVerticales} := y(0) = 2, D(y)(0) = \text{VelocidadInicial} \cdot \sin\left(\frac{\text{Pi}}{4}\right)$$

$$\text{CondicionesVerticales} := y(0) = 2, D(y)(0) = \frac{1251}{40000} \sqrt{1043130} \sqrt{2} \quad (10)$$

$$> \text{CondicionHorizontal} := x(0) = 5$$

$$\text{CondicionHorizontal} := x(0) = 5 \quad (11)$$

$$> \text{SolucionVertical} := \text{dsolve}(\{\text{EcuacionVertical}, \text{CondicionesVerticales}\})$$

$$\text{SolucionVertical} := y(t) = -\frac{981}{200} t^2 + \frac{1251}{40000} \sqrt{1043130} \sqrt{2} t + 2 \quad (12)$$

$$> \text{SolucionHorizontal} := \text{dsolve}(\{\text{EcuacionHorizontal}, \text{CondicionHorizontal}\})$$

$$\text{SolucionHorizontal} := x(t) = \frac{1251}{20000} \sqrt{521565} t + 5 \quad (13)$$

$$> \text{TiempoVuelo} := \text{solve}(\text{rhs}(\text{SolucionVertical}) = 0, t); \text{evalf}(\%, 4)$$

$$\begin{aligned} \text{TiempoVuelo} := & \frac{139}{21800} \sqrt{521565} - \frac{1}{65400} \sqrt{92438416285}, \frac{139}{21800} \sqrt{521565} \\ & + \frac{1}{65400} \sqrt{92438416285} \\ & -0.043, 9.253 \end{aligned} \quad (14)$$

$$> \text{DistanciaHorizontal} := \text{subs}(t = \text{TiempoVuelo}_2, \text{rhs}(\text{SolucionHorizontal})); \text{evalf}(\%, 4)$$

$$\begin{aligned} \text{DistanciaHorizontal} := & \frac{1251}{20000} \sqrt{521565} \left(\frac{139}{21800} \sqrt{521565} + \frac{1}{65400} \sqrt{92438416285} \right) \\ & + 5 \\ & 423.0 \end{aligned} \quad (15)$$

$$> \text{DerSol} := \text{rhs}(\text{diff}(\text{SolucionVertical}, t)) = 0$$

$$\text{DerSol} := -\frac{981}{100} t + \frac{1251}{40000} \sqrt{1043130} \sqrt{2} = 0 \quad (16)$$

$$> \text{TiempoAlturaMaxima} := \text{solve}(\text{DerSol}, t); \text{evalf}(\%, 4)$$

$$\begin{aligned} \text{TiempoAlturaMaxima} := & \frac{139}{43600} \sqrt{1043130} \sqrt{2} \\ & 4.603 \end{aligned} \quad (17)$$

$$> \text{AlturaMaxima} := \text{subs}(t = \text{TiempoAlturaMaxima}, \text{rhs}(\text{SolucionVertical})); \text{evalf}(\%, 4)$$

$$\begin{aligned} \text{AlturaMaxima} := & \frac{169611773}{1600000} \\ & 106.0 \end{aligned} \quad (18)$$