> restart

> $Ecua := -\left(\mathrm{sqrt}\left(x^2 - y(x)^2\right) + y(x)\right) + x \cdot diff(y(x), x) = 0$

$$Ecua := -\sqrt{x^2 - y(x)^2} - y(x) + x\left(\frac{d}{dx} y(x)\right) = 0 \quad (1)$$

> $with(DEtools)$:

> $odeadvisor(Ecua)$

$$[[\_homogeneous, class\ A], \_rational, \_dAlembert] \quad (2)$$

> $EcuaDos := eval(subs(y(x) = x \cdot u(x), Ecua))$

$$EcuaDos := -\sqrt{x^2 - x^2 u(x)^2} - x\,u(x) + x\left(u(x) + x\left(\frac{d}{dx} u(x)\right)\right) = 0 \quad (3)$$

> $EcuaTres := simplify(isolate(EcuaDos, diff(u(x), x)))$

$$EcuaTres := \frac{d}{dx} u(x) = \frac{\sqrt{-x^2\left(u(x)^2 - 1\right)}}{x^2} \quad (4)$$

> $EcuaTresCud := lhs(EcuaTres)^2 = rhs(EcuaTres)^2$

$$EcuaTresCud := \left(\frac{d}{dx} u(x)\right)^2 = -\frac{u(x)^2 - 1}{x^2} \quad (5)$$

> $EcuaCuatro := x^2 \cdot lhs(EcuaTresCud) = x^2 \cdot rhs(EcuaTresCud)$

$$EcuaCuatro := x^2\left(\frac{d}{dx} u(x)\right)^2 = -u(x)^2 + 1 \quad (6)$$

> $EcuaCuatroRaiz := x \cdot diff(u(x), x) - \mathrm{sqrt}(rhs(EcuaCuatro)) = 0$

$$EcuaCuatroRaiz := x\left(\frac{d}{dx} u(x)\right) - \sqrt{-u(x)^2 + 1} = 0 \quad (7)$$

> $P := 1$

$$P := 1 \quad (8)$$

> $Q := -\sqrt{-u^2 + 1}$

$$Q := -\sqrt{-u^2 + 1} \quad (9)$$

> $R := x$

$$R := x \quad (10)$$

> $S := 1$

$$S := 1 \quad (11)$$

> $SolGral := int\left(\frac{P}{R}, x\right) + int\left(\frac{S}{Q}, u\right) = \_C1$

$$SolGral := \ln(x) - \arcsin(u) = \_C1 \quad (12)$$

> $SolGralFinal := subs\left(u = \frac{y}{x}, SolGral\right)$

$$SolGralFinal := \ln(x) - \arcsin\left(\frac{y}{x}\right) = \_C1 \quad (13)$$

> $SolGralDos := \ln(x) - \arcsin\left(\frac{y(x)}{x}\right) = \_C1$

$$SolGralDos := \ln(x) - \arcsin\left(\frac{y(x)}{x}\right) = \_C1 \quad (14)$$

> $DerSol := expand(isolate(simplify(diff(SolGralDos, x)), diff(y(x), x)))$

$$DerSol := \frac{d}{dx} y(x) = \sqrt{1 - \frac{y(x)^2}{x^2}} + \frac{y(x)}{x} \quad (15)$$

> $DerSolUno := lhs(DerSol) - \frac{y(x)}{x} = rhs(DerSol) - \frac{y(x)}{x}$

$$DerSolUno := \frac{d}{dx} y(x) - \frac{y(x)}{x} = \sqrt{1 - \frac{y(x)^2}{x^2}} \quad (16)$$

> $DerSolDos := simplify(lhs(DerSolUno)^2 = rhs(DerSolUno)^2)$

$$DerSolDos := \frac{\left(-x\left(\frac{d}{dx} y(x)\right) + y(x)\right)^2}{x^2} = -\frac{y(x)^2 - x^2}{x^2} \quad (17)$$

> $DerSolTres := lhs(DerSolDos) \cdot x^2 = rhs(DerSolDos) \cdot x^2$

$$DerSolTres := \left(-x\left(\frac{d}{dx} y(x)\right) + y(x)\right)^2 = x^2 - y(x)^2 \quad (18)$$

> $DerSolCuatro := simplify(isolate(DerSolTres, diff(y(x), x)))$

$$DerSolCuatro := \frac{d}{dx} y(x) = \frac{-\sqrt{x^2 - y(x)^2} + y(x)}{x} \quad (19)$$

> $DerEcua := simplify(isolate(Ecua, diff(y(x), x)))$

$$DerEcua := \frac{d}{dx} y(x) = \frac{\sqrt{x^2 - y(x)^2} + y(x)}{x} \quad (20)$$

>

PROBLEMA DE LA BALA QUE PASA A TRAVÉS DE UNA PLACA DE MADERA

> $restart$

> $EcuaUno := diff(V(t), t) = -K \cdot V(t)^2$

$$EcuaUno := \frac{d}{dt} V(t) = -K V(t)^2 \quad (21)$$

> $with(DEtools)$:

> $odeadvisor(EcuaUno)$

$$[\_quadrature] \quad (22)$$

> $SolGralUno := dsolve(EcuaUno)$

$$SolGralUno := V(t) = \frac{1}{K t + \_C1} \quad (23)$$

> $CondIni := V(0) = 200$

$$CondIni := V(0) = 200 \quad (24)$$

> $SolPartUno := dsolve(\{EcuaUno, CondIni\})$

$$SolPartUno := V(t) = \frac{200}{200 K t + 1} \quad (25)$$

> $EcuaDos := diff(x(t), t) = rhs(SolPartUno)$

$$EcuaDos := \frac{d}{dt} x(t) = \frac{200}{200 K t + 1} \quad (26)$$

> $odeadvisor(EcuaDos)$

(27)

$$[\_quadrature] \tag{27}$$

> $SolGralDos := dsolve(EcuaDos)$

$$SolGralDos := x(t) = \frac{\ln(200\,K\,t+1)}{K} + \_C1 \tag{28}$$

> $CondIniDos := x(0) = 0$

$$CondIniDos := x(0) = 0 \tag{29}$$

> $SolPartDos := dsolve(\{EcuaDos, CondIniDos\})$

$$SolPartDos := x(t) = \frac{\ln(200\,K\,t+1)}{K} \tag{30}$$

>

> $ParametroUno := isolate(subs(V(t) = 80, SolPartUno), K)$

$$ParametroUno := K = \frac{3}{400\,t} \tag{31}$$

> $SolPartTres := subs(K = rhs(ParametroUno), SolPartDos)$

$$SolPartTres := x(t) = \frac{400}{3}\ln\left(\frac{5}{2}\right)t \tag{32}$$

> $TiempoFinal := isolate\left(subs\left(x(t) = \frac{1}{10}, SolPartTres\right), t\right)$

$$TiempoFinal := t = \frac{3}{4000\ln\left(\frac{5}{2}\right)} \tag{33}$$

> $evalf(\%, 5)$

$$t = 0.00081855 \tag{34}$$

>