

> restart :

Conor Solner

Coordinating Seminar

Newtons Second Law : Hang Time

> g := 32 :

NSL := diff(m·y(t), t, t) = -m·g

$$NSL := m \left(\frac{d^2}{dt^2} y(t) \right) = -32 m \quad (1)$$

> sol := dsolve({NSL, y(0) = 0, D(y)(0) = v})

$$sol := y(t) = -16 t^2 + t v \quad (2)$$

> y := unapply(rhs(sol), t)

$$y := t \rightarrow -16 t^2 + t v \quad (3)$$

> tmax := solve(diff(y(t), t) = 0, t)

$$tmax := \frac{1}{32} v \quad (4)$$

> vmh := y(tmax) = 2.5

$$vmh := \frac{1}{64} v^2 = 2.5 \quad (5)$$

What is the velocity when time is maximum?

> answer := rhs(solve({vmh, v > 0}, v) [1])

$$answer := 12.64911064 \quad (6)$$

> h := unapply(y(t), t)

$$h := t \rightarrow -16 t^2 + t v \quad (7)$$

> solve(diff(h(t), t) = 0, t)

$$\frac{1}{32} v \quad (8)$$

What is the time to reach maximum velocity?

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> tconfirmed :=  $\frac{vpos}{32}$ 
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tconfirmed := 0.3952847075
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(9)

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What is the maximum Hang Time an athlete experience?
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> answer2 := eval(2·tconfirmed)
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answer2 := 0.7905694150
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(10)