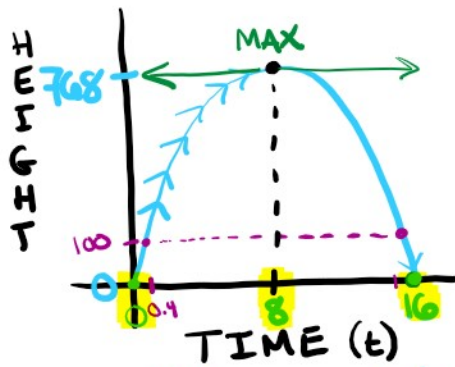


6.1 Physics Problems

Wednesday, June 12, 2019 7:14 AM



Object starts on ground

$$f(t) = -16t^2 + 256t$$

What is the initial height?

$$f(0) = -16(0)^2 + 256(0) = 0$$

When is the object at a height of 100?

$$100 = -16t^2 + 256t$$

$$-100 \quad -100$$

$$0 = -16t^2 + 256t - 100$$

$$0 = -4(4t^2 - 64t + 25)$$

$$a=4 \quad b=-64 \quad c=25$$

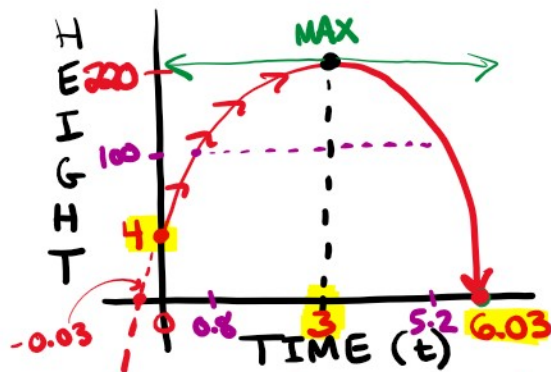
$$t = \frac{64 \pm \sqrt{(-64)^2 - 4(4)(25)}}{2(4)}$$

$$= \frac{64 \pm \sqrt{3600}}{8} = 15.6 \quad 0.4$$

When does the object hit the ground?

$$0 = -16t^2 + 256t$$

$$0 = -16t(t - 16)$$



Object starts above ground

$$f(t) = -24t^2 + 144t + 4$$

What is the initial height?

$$f(0) = -24(0)^2 + 144(0) + 4 = 4$$

When is the object at a height of 100?

$$100 = -24t^2 + 144t + 4$$

$$-100 \quad -100$$

$$0 = -24t^2 + 144t - 96$$

$$0 = -24(t^2 - 6t + 4)$$

$$a=1 \quad b=-6 \quad c=4$$

$$t = \frac{6 \pm \sqrt{(-6)^2 - 4(1)(4)}}{2(1)}$$

$$= \frac{6 \pm \sqrt{20}}{2} = 5.2 \quad 0.8$$

When does the object hit the ground?

$$0 = -24t^2 + 144t + 4$$

$$0 = -4(6t^2 - 36t - 1)$$

$$a=6 \quad b=-36 \quad c=-1$$

$$0 = -16t(t-16)$$

$$\downarrow \quad \downarrow$$

$$-16t = 0 \quad t-16 = 0$$

$$\boxed{t=0} \quad \boxed{t=16}$$

What is the maximum height of the object?

$$t = 8$$

$$f(8) = -16(8)^2 + 256(8) = \boxed{768}$$

$$a=6 \quad b=-36 \quad c=-1$$

$$t = \frac{36 \pm \sqrt{(-36)^2 - 4(6)(-1)}}{2(6)} = \frac{36 \pm 36.03}{12}$$

$$t = 6.03 \quad \text{or} \quad t = -0.03$$

What is the maximum height of the object?

$$t = 3$$

$$f(3) = -24(3)^2 + 144(3) + 4 = \boxed{220}$$

$$f'(t) = -32t + 256$$

What is the initial velocity?

↑

$$t=0$$

$$f'(0) = -32(0) + 256 = \boxed{256}$$

What is the instantaneous velocity at $t = 3.5$?

$$f'(3.5) = -32(3.5) + 256 = \boxed{144}$$

Positive Velocity means object is going up

What is the speed at $t = 3.5$?

$$\text{speed} = |\text{velocity}|$$

$$\text{speed} = |144| = \boxed{144}$$

$$f'(t) = -48t + 144$$

What is the initial velocity?

↑

$$t=0$$

$$f'(0) = -48(0) + 144 = \boxed{144}$$

What is the instantaneous velocity at $t = 3.5$?

$$f'(3.5) = -48(3.5) + 144 = \boxed{-24}$$

Negative velocity means object is falling

What is the speed at $t = 3.5$?

$$\text{speed} = |\text{velocity}|$$

$$\text{speed} = |-24| = \boxed{24}$$

What is the average velocity? What is the average velocity?

What is the average velocity
from $t=1$ to $t=5$?

velocity
 $t=1$

velocity
 $t=5$

$$f'(1) = -32(1) + 256 = 224$$
$$f'(5) = -32(5) + 256 = 96$$

$$V_{\text{avg}} = \frac{224 + 96}{2} = \boxed{160}$$

When does the object reach
its maximum height?

$$f'(t) = -32t + 256 = 0$$

$$\begin{array}{r} -32t = -256 \\ -32 \quad -32 \\ \hline \end{array}$$

$$\boxed{t=8}$$

$$f''(t) = -32$$

What is the acceleration
at $t=4$?

$$\boxed{-32}$$

What is the average velocity
from $t=1$ to $t=5$?

velocity
 $t=1$

velocity
 $t=5$

$$f'(1) = -48(1) + 144 = 96$$
$$f'(5) = -48(5) + 144 = -96$$

$$V_{\text{avg}} = \frac{96 + (-96)}{2} = \boxed{0}$$

When does the object reach
its maximum height?

$$f'(t) = -48t + 144 = 0$$

$$\begin{array}{r} -48t = -144 \\ -48 \quad -48 \\ \hline \end{array}$$

$$\boxed{t=3}$$

$$f''(t) = -48$$

What is the acceleration
at $t=4$?

$$\boxed{-48}$$

ACCELERATION
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