

Physics 101
 Homework 1 Solutions

35 pt. 1) a) see attached

(7)

(7)

b) $v(t) = x'(t) = -2 + 20t$ (m/s)

c) $a(t) = v'(t) = x''(t) = 20$ (m/s²)

(7)

d) In order for the particle to turn around, the velocity must go to zero because in order to turn around, the velocity must go from positive to negative.

$$0 = -2 + 20t$$

$$2 = 20t$$

$$t = \frac{1}{10} \text{ sec}$$

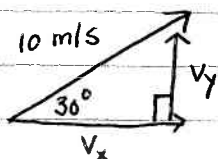
(7)

e) We just found that the speed is zero at $t = \frac{1}{10}$ sec, so we just plug this value into our position formula.

$$x\left(\frac{1}{10}\right) = 5 - \frac{2}{10} + \frac{10}{100} = \frac{50 - 2 + 1}{10} = \frac{49}{10} = \underline{\underline{4.9 \text{ m}}}$$

(7)

40 pt. 2)



a) $v_x = 10 \cos 30^\circ = \underline{\underline{8.66 \text{ m/s}}}$

(5)

b) $v_y = 10 \sin 30^\circ = \underline{\underline{5 \text{ m/s}}}$

(5)

c) maximum height where $v_y = 0$ $a_y = -9.8 \text{ m/s}^2$

$$v_y = v_{oy} + a_y t$$

(6)

$$0 = 5 \text{ m/s} - (9.8 \text{ m/s}^2) t$$

$$9.8 t = 5 \text{ m/s}$$

$$t = \underline{\underline{.510 \text{ s}}}$$

d) $y = y_0 + v_{oy} t + \frac{1}{2} a t^2$

$$0 = 10 + 5t + \frac{1}{2}(-9.8)t^2$$

$$-4.9t^2 + 5t + 10 = 0$$

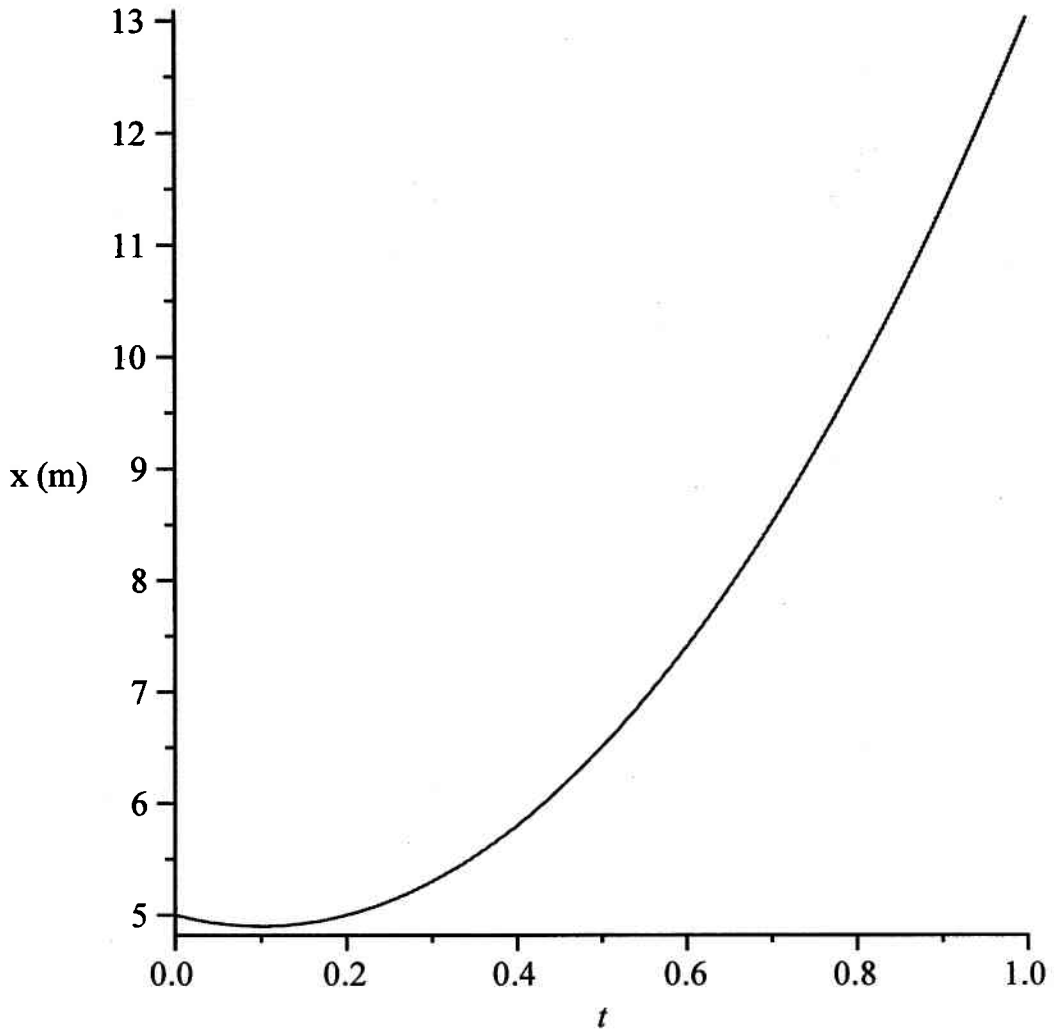
(6)

$$t = \frac{-5 \pm \sqrt{25 + 4(4.9)(10)}}{2(-4.9)}$$

$$= -1.007 \text{ sec or } \underline{\underline{2.027 \text{ sec}}}$$

use the positive root because that corresponds to the time


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> plot(5 - 2t + 10t^2, t=0..1)
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>
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