Lyell c. Read

CH 11.7 Homework

10/7/2018

8, 12, 16, 32, 36, 40, 44, 48, 67, 68

7) (ans check for 8)) $r(t) = \langle 3t^2+1, 4t^2+3 \rangle$

$r'(t) = v(t) = \langle 6t, 8t \rangle$ $r''(t) = v'(t) = a(t) = \langle 6, 8 \rangle$

$\boxed{v(t) = \langle 6t, 8t \rangle}$ $\boxed{\text{Speed: } |v(t)| = \sqrt{100t^2} = 10t}$ $\boxed{a(t) = \langle 6, 8 \rangle}$

8) $r(t) = \langle \frac{5}{2}t^2+3, 6t^2+10 \rangle$ $\boxed{v(t) = r'(t) = \langle 5t, 12t \rangle}$

$\text{speed} = |v(t)| = \sqrt{25t^2+144t^2} = \boxed{13t}$ $\boxed{a(t) = \langle 5, 12 \rangle}$

12) $r(t) = \langle 3\cos(t), 4\sin(t) \rangle$ $\boxed{v(t) = \langle -3\sin t, 4\cos t \rangle}$

$\boxed{|v(t)| = \sqrt{9\sin^2 t + 16\cos^2 t}}$ $\boxed{a(t) = \langle -3\cos t, -4\sin t \rangle}$

16) $r(t) = \langle 3\sin t, 5\cos t, 4\sin t \rangle$ $\boxed{v(t) = \langle 3\cos t, -5\sin t, 4\cos t \rangle}$

$\boxed{|v(t)| = \sqrt{9\cos^2 t + 16\cos^2 t + 25\sin^2 t}}$ $\boxed{a(t) = \langle -3\sin(t), -5\cos t, -4\sin t \rangle}$

32) (ans check for 32)) $a(t) = \langle 0, 1 \rangle$ $v_i = \langle 2, 3 \rangle$ $x_i = \langle 0, 0 \rangle$

$v(t) = \langle C, t + C \rangle = \boxed{\langle 2, t+3 \rangle}$

$r(t) = \langle 2t + C, \frac{1}{2}t^2 + 3t + C \rangle = \boxed{\langle 2t, \frac{1}{2}t^2 + 3t \rangle}$

32) $a(t) = \langle 1, 2 \rangle$ $v_0 = \langle 1, 1 \rangle$ $x_0 = \langle 2, 3 \rangle$

$v(t) = \langle t + C, 2t + C \rangle = \boxed{\langle t+1, 2t+1 \rangle}$

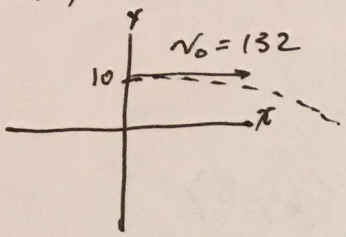
$r(t) = \langle \frac{1}{2}t^2 + t + C, t^2 + t + C \rangle = \boxed{\langle \frac{1}{2}t^2 + t + 2, t^2 + t + 3 \rangle}$

36) $a(t) = \langle e^{-t}, 1 \rangle$ $v_0 = \langle 1, 0 \rangle$ $x_0 = \langle 0, 0 \rangle$

$v(t) = \langle -e^{-t} + C, t + C \rangle = \boxed{\langle -e^{-t} + 2, t \rangle}$

$r(t) = \langle e^{-t} + 2t + C, \frac{1}{2}t^2 + C \rangle = \boxed{\langle e^{-t} + 2t - 1, \frac{1}{2}t^2 \rangle}$

40)



$r(t) = \langle 132t, -\frac{1}{2}gt^2 + 10 \rangle \quad | g = 32$

Horiz. Pos — vertical pos.

$v(t) = \langle 132, -gt \rangle$

↳ Time of Flight t is when

$\frac{1}{2}gt^2 = 10 \quad | g = 32$

$16t^2 = 10$

$t^2 = \frac{10}{16} = \boxed{\sqrt{10}/\sqrt{16} = T}$

At T (see rightside), x-position is $132T = \boxed{\frac{132\sqrt{10}}{4}}$

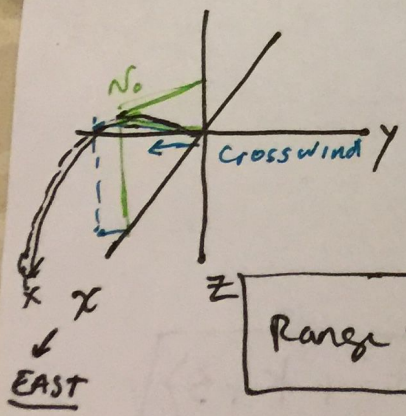
Because of horizontal launch, h_{max} is at $t=0$, at 10 ft.

44) $a(t) = \langle 1, t, 4t \rangle \quad v_0 = \langle 20, 0, 0 \rangle \quad x_0 = \langle 0, 0, 0 \rangle$

$v(t) = \langle t + C, \frac{1}{2}t^2 + C, 2t^2 + C \rangle = \boxed{\langle t + 20, \frac{1}{2}t^2 + C, 2t^2 + C \rangle}$

$r(t) = \boxed{\langle \frac{1}{2}t^2 + 20t, \frac{1}{6}t^3, \frac{2}{3}t^3 \rangle}$

48) $v_0 = \langle 50, 0, 30 \rangle$



$a(t) = \text{crosswind} = \langle 0, -0.8, \cancel{0} \rangle \quad = -32$

$v(t) = \langle C, -0.8t + C, C \rangle = \langle 50, -0.8t, \cancel{30} \rangle \quad -32t + C$

$r(t) = \langle 50t + \cancel{C}, -0.4t^2, \cancel{30t} \rangle \quad -16t^2 + 30t \quad -32t + 30$

Range $= \cancel{50} \cdot \frac{30}{16}$ → evaluate $\left| r\left(\frac{30}{16}\right) \right|$ ... from

T of flight is when

$\frac{16t^2}{T} = \frac{30t}{t} \quad t \neq 0$

$16t = 30$

$\boxed{t = \frac{30}{16}}$

Height Max is when $v_z = 0$, when

$32t = 30$

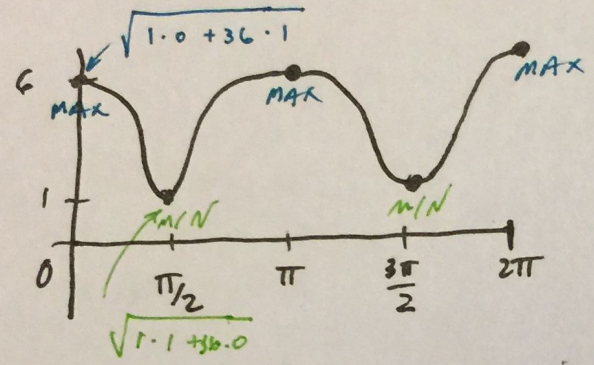
$t = \frac{30}{32}$ → $\boxed{H_{max} = -16\left[\frac{30}{32}\right]^2 + 30\left[\frac{30}{32}\right]}$

67) $r(t) = \langle a\cos t, b\sin t \rangle$ on $t = [0..2\pi]$ $a>0$ $b>0$

a) $\boxed{v(t) = \langle -a\sin t, b\cos t \rangle}$ on $t = [0..2\pi]$

Speed $= |v(t)| = \boxed{\sqrt{a^2\sin^2 t + b^2\cos^2 t}}$

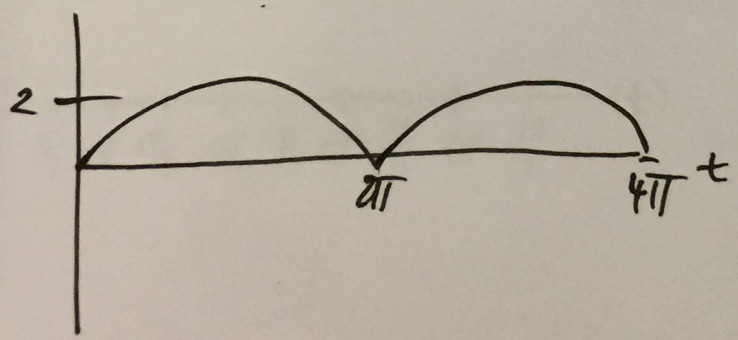
b) $a=1$, $b=6$ graph speed(t) on $[0..2\pi]$, mark max, min



c) Yes it is, as speed is the $|v(t)|$, which would ignore any sign. this shows an increase, decrease in speed.

d) Max speed is the larger of (a,b) } see graph...
Min speed is the smaller of (a,b)

68) $r(t) = \langle t - \sin t, 1 - \cos t \rangle$ $v(t) = \langle 1 - \cos t, \sin t \rangle$



$|v(t)| = \sqrt{1+\cos^2 t + \sin^2 t}$

$= \boxed{\sqrt{2}}$

$a(t) = \langle \sin t, \cos t \rangle$

$|a(t)| = \sqrt{\sin^2 + \cos^2}$

$= \boxed{1}$

Why is there a cusp?
-not a friction cue