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)) $r(t) = \langle 3t^2+1, 4t^2+3 \rangle$

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

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

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

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

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

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

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

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

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

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

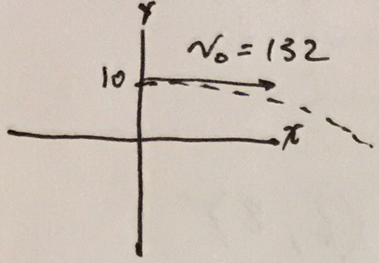
$r(t) = \langle \frac{1}{2}t^2 + t + c, t^2 + t + c \rangle = \boxed{\langle \frac{1}{2}t^2 + t + 2, t^2 + t + 3 \rangle}$

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

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

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

40)



$$r(t) = \langle \underbrace{132t}_{\text{Horiz. pos}}, \underbrace{-\tfrac{1}{2}gt^2 + 10}_{\text{vertical pos.}} \rangle \quad | g = 32$$

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

↳ Time of flight t is when

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

$$\cancel{8}\ 16t^2 = 10$$

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

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

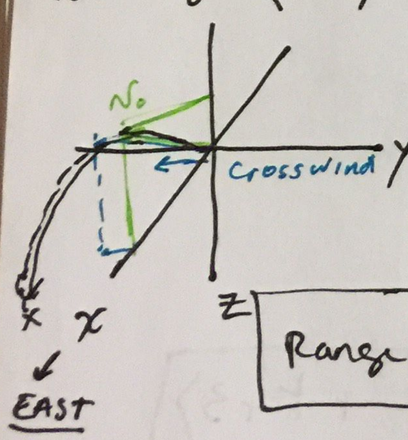
Because of horizontal launch, h_{max} is at $t=0$, at 10 ft.

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

$$v(t) = \langle t + c, \tfrac{1}{2}t^2 + c, 2t^2 + c \rangle = \boxed{\langle t + 20, \tfrac{1}{2}t^2 \cancel{+c}, 2t^2 \cancel{+c} \rangle}$$

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

48) $v_0 = \langle 50, 0, 30 \rangle$ Used wrong grav constant :) $\overset{-9.81}{=} \cancel{-32}$



$$a(t) = \text{crosswind} = \langle 0, -0.8, \overset{-9.81}{\cancel{-32}} \rangle$$

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

-9.81 $\cancel{-32}t + c$

$\cancel{-32t + 30}$

$-9.81t + 30$

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

$\overset{-4.905}{\cancel{-16}}t^2 + 30t$

$\boxed{\text{Range} = \cancel{50} \cdot \cancel{\tfrac{30}{16}}}$ → $\boxed{\text{evaluate } \left| r\left(\tfrac{30}{\cancel{16}}\right) \right| \ldots \ \cancel{\text{from}}\ 4.905}$

Height Max is when $v_z = 0$, when

$$\overset{9.81}{\cancel{32}}t = 30$$

$$t = \frac{30}{\underset{9.81}{\cancel{32}}} \rightarrow \boxed{H_{max} = -\overset{4.905}{\cancel{16}}\left[\frac{30}{\underset{9.81}{\cancel{32}}}\right]^2 + 30\left[\frac{30}{\underset{9.81}{\cancel{32}}}\right]}$$

T of flight is when

$$\frac{\overset{4.905}{\cancel{16}}t^2}{t} = \frac{30t}{t} \qquad t \neq 0$$

$$\overset{4.905}{\cancel{16}}t = 30$$

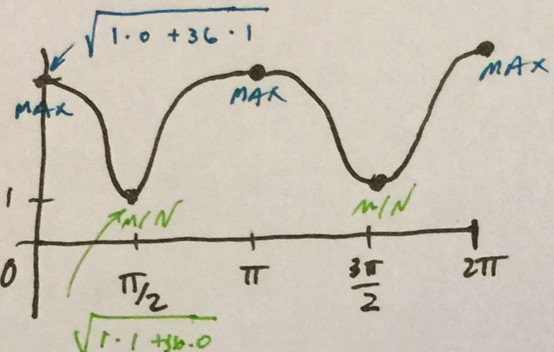
$$\boxed{t = \frac{30}{\underset{4.905}{\cancel{16}}}}$$

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

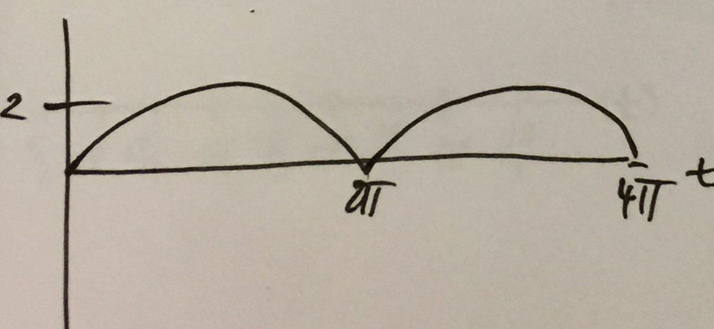
b) $a=1$, $b=6$ graph Speed (t) on $[0..2\pi]$, Mark max, min



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)
Min speed is the smaller of (a,b) $\Big\}$ see graph...

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 curve