96. $h=5$ $V_0=225$ ft/sec $\theta=15°$

a) $x = 225\cos 15° T$
$y = 5 + 225\sin 15° T - 16T^2$

b) To find distance, I need to know time.
To find time, use y (height)...

$0 = 5 + 225\sin 15° T - 16T^2$
either use Quad Form or the graph. calc. to solve for T.

$T = 3.724$ sec.

$X(T) \approx 809$ ft.

c) max of ~58 ft @ $T = 1.862$ sec.
d) 3.724 sec

97. $h_0 = 7$ ft $h_1 = 4$ ft $d = 30$ yds $= 90$ ft $\theta = 35°$ $V_0 = ?$

a) $x = V_0 \cos 35° T$

$y = 7 + V_0 \sin 35° T - 16T^2$

b) find V_0. To find V_0, sub end values $(\overset{x}{90}\text{ ft}, \overset{y}{4}\text{ ft})$ into both eqns...

$$\begin{cases} 90 = V_0 \cos 35° T \\ 4 = 7 + V_0 \sin 35° T - 16T^2 \end{cases}$$

Solve the system of eqns for T & V_0
Use Substitution or graphing calc.

$$T = \frac{90}{V_0 \cos 35°} \Rightarrow 4 = 7 + V_0 \sin 35° \left(\frac{90}{V_0 \cos 35°}\right) - 16\left(\frac{90}{V_0 \cos 35°}\right)$$

$$4 = 7 + 90\tan 35° - \frac{16 \cdot 90^2 \sec^2 35°}{V_0^2}$$

$$V_0^2 = \frac{(-16 \cdot 90^2 \sec^2 35°)}{(4 - 7 - 90\tan 35°)} = 2925.56 \Rightarrow$$

$\Rightarrow V_0 = 54.09$ ft/sec

c) Max height of ~22 ft at $T \approx 1$ sec

d) Find T when $y = 4$

$4 = 7 + 54.09 \sin T - 16T^2$

$0 = 3 + 54.09 \sin T - 16T^2$

Use graphing calc or Quad Form.

$T = 2.03$ sec.

98. Given: $x = V_0 \cos\theta T$
$y = h + V_0 \sin\theta T - 16T^2$

Verify: $y = \frac{-16\sec^2\theta}{V_0^2} x^2 + \tan\theta x + h$

Solve for T $\Rightarrow$ $T = \frac{x}{V_0 \cos\theta}$

Sub for T in y $\Rightarrow$ $y = h + V_0 \sin\theta \left(\frac{x}{V_0 \cos\theta}\right) - 16\left(\frac{x}{V_0 \cos\theta}\right)^2$

Simplify $\Rightarrow$ $y = h + \frac{\sin\theta}{\cos\theta} x - \frac{16x^2}{V_0^2 \cos^2\theta}$

$= \frac{-16\sec^2\theta}{V_0^2} x^2 + \tan\theta x + h$ (a, b, c)

99. $y = \underset{c}{7} + \underset{b}{1}x - \underset{a}{0.02}x^2$

a) $h = 7$ $\quad \tan\theta = 1$ $\quad \theta = 45°$

Compare given eqn to this eqn.

$-0.02x^2 = \frac{-16\sec^2\theta}{V_0^2} x^2$

$V_0^2 = \frac{-16\sec^2\theta}{-.02}$ note: $\theta = 45°$

$V_0^2 = \frac{+16\left(\frac{2}{\sqrt{2}}\right)^2}{.02} = \frac{16 \cdot \frac{4}{2}}{.02}$

$V_0^2 = \frac{32}{.02} = 1600 \Rightarrow$

$h=7 \quad \theta=45^\circ \quad V_0=40$

$X = 40\cos 45^\circ T = 40\left(\frac{\sqrt{2}}{2}\right)T = 20\sqrt{2}\,T$

$Y = 7 + 40\sin 45^\circ T - 16T^2 = 7 + 20\sqrt{2}\,T - 16T^2$

b) Graphs are the same.

c) Max height of 19.5 ft @ T = 25 sec
Max distance of 1590.3 ft @ T = 56.2 sec.

100. $y = 6 + x - .08x^2$

$h=6 \quad \theta=1 \quad V_0^2 = \frac{32}{.08} = 400 \quad V_0 = 20$

$X = 20\cos 45^\circ T \Rightarrow 20\frac{\sqrt{2}}{2}T = 10\sqrt{2}\,T$

$Y = 6 + 20\sin 45^\circ T - 16T^2 \Rightarrow 6 + 10\sqrt{2}\,T - 16T^2$

Max height of 9.125 ft @ T = 6.25 sec
Max distance of 239.4 ft @ T = 16.93 sec

I tended to switch between func & Par modes on the calculator a lot.

FUNC Mode lets me solve quad. eqns on calc (to find T)

PAR Mode lets me use the found T to find height & distance at a given point.