HW ~~1~~4 ~~[illegible]~~ 10 pts. 1

2.18 #3 ~~1~~0.8 inches = 0.9 foot

$$h(t) = \left(\frac{-b\sqrt{g}}{\sqrt{2}A} t + \sqrt{y} \right)^2$$

$y = 15$ ft

$b = \left(\frac{0.9}{2} \text{ ft}\right)^2 \times \pi$

$A = \left(\frac{25}{2} \text{ ft}\right)^2 \times \pi$

$g = 32.174$ ft/s^2

$$h(t) = \left(- \frac{0.45^2 \cancel{\pi} \times \sqrt{32.174}}{\sqrt{2} \times 12.5^2 \times \cancel{\pi}} t + \sqrt{15} \right)^2$$

$$= \left(\sqrt{15} - \frac{\sqrt{32.174} \times 0.45^2}{\sqrt{2} \times 12.5^2} t \right)^2$$

$$= (\sqrt{15} - 0.005198t)^2$$

when $h(t) = 0$, $t = \dfrac{\sqrt{15}}{0.005198} = 745.08$ s.

graph I. (the left part of $\bigvee$).

3.1 #3 $y^3 dy = x^6 dx$

$\Downarrow$

$\int y^3 dy = \int x^6 dx$

$$\frac{y^4}{4} = \frac{\cancel{y}x^7}{7} + c$$

$$\Downarrow$$

$$\frac{y^4}{4} - \frac{x^7}{7} - c = 0$$

#4 $$\frac{1}{8+\frac{1}{10}y}\,dy = \frac{1}{e^x}\,dx$$

$$\Downarrow$$

$$\int \frac{10}{y+80}\,dy = \int e^{-x}\,dx$$

$$\Downarrow$$

$$10\ln|y+80| = -e^{-x} + c$$

$$\Downarrow$$

$$10\ln|y+80| + e^{-x} - c = 0$$

or ($ce^{-e^{-x}} - (8+\frac{1}{10}y)^{10} = 0$)

3.2 #1 $$\frac{dy}{d\cancel{t}} = ay$$

$$\Downarrow$$

$$\frac{1}{y}\,dy = a\,d\cancel{t}$$

$$\Downarrow$$

$$\int \frac{1}{y}\,dy = \int a\,dx$$

3.2 # 1

$$\frac{dy}{dt} = ky$$

$$y = 100\, e^{kt}$$

amount doubles in 1 hr

$$\Rightarrow \quad 200 = 100\, e^{k}$$

$$\Rightarrow \quad k = \ln 2$$

$$y = 100\, e^{(\ln 2) t}$$

$$\Rightarrow \quad y = 100 \times 2^{t}$$

After 1.5 hrs, $\boxed{y = 100 \times 2^{1.5}}$

3

$$y = y_0 e^{kt}$$

$$0.7\, y_0 = y_0 e^{k \times 16}$$

$$\Rightarrow \quad k = \frac{\ln(0.7)}{16}$$

$$\frac{y_0}{2} = y_0 e^{\frac{\ln(0.7)}{16} t} \quad \Rightarrow \quad e^{\frac{\ln(0.7)}{16} t} = \frac{1}{2}$$

$$\Rightarrow \boxed{t = \frac{16 \ln(1/2)}{\ln(0.7)}}$$