

4.3 - Supplemental Word Problems

* ANSWER KEY

1a) $h(t) = -16\left(t^2 - \frac{5}{8}t\right) + 4$

$$h(t) = -16\left(t^2 - \frac{5}{8}t + \frac{25}{256} - \frac{25}{256}\right) + 4$$

$$h(t) = -16\left(t - \frac{5}{16}\right)^2 + \frac{400}{256} + \frac{1024}{256}$$

$$h(t) = -16\left(t - \frac{5}{16}\right)^2 + \frac{89}{16}$$

vertex $\left(\frac{5}{16}, \frac{89}{16}\right)$
 \uparrow \uparrow
 t max height

Max height of 5.5625 ft, 0.3125s into shot

b) $h(t) = -16\left(t - \frac{5}{16}\right)^2 + \frac{89}{16}$

$$h(0.2) = -16\left(0.2 - \frac{5}{16}\right)^2 + \frac{89}{16}$$

$$h(0.2) = -0.2025 + \frac{89}{16} = \underline{\underline{5.36 \text{ ft}}}$$

Way Up (before max)

c) $h(t) = 0$

$$0 = -16\left(t - \frac{5}{16}\right)^2 + \frac{89}{16}$$

$$\frac{-89}{16} = \frac{-16\left(t - \frac{5}{16}\right)^2}{-16}$$

$$\frac{89}{256} = \left(t - \frac{5}{16}\right)^2$$

$$t - \frac{5}{16} = \pm \sqrt{\frac{89}{256}}$$

$$t - \frac{5}{16} = \pm \frac{\sqrt{89}}{16}$$

$$t = \frac{5 \pm \sqrt{89}}{16}$$

$$t = 0.90 \text{ s}, \quad \begin{matrix} -0.28 \\ \uparrow \\ \text{reject} \end{matrix}$$

$$\underline{\underline{0.90 \text{ s}}}$$

d) $h(t) = -16\left(t - \frac{5}{16}\right)^2 + \frac{89}{16}$

$$t = 0$$

$$h(0) = -16\left(0 - \frac{5}{16}\right)^2 + \frac{89}{16}$$

$$h(0) = -1.5625 + \frac{89}{16}$$

$$h(0) = \underline{\underline{4 \text{ ft}}}$$

①

OVER →

2) a) y-int: set $x=0$
 $h(0) = -4.9(0)^2 + 6.8(0) + 3$

$$h(0) = 3$$

$h = 3\text{m}$, height of the diving board
 (where the diver was at $t=0$)

b) $h(0.6) = -4.9(0.6)^2 + 6.8(0.6) + 3$

$$h(0.6) = -1.764 + 4.08 + 3 = 5.316$$

at 0.6s , diver is 5.316m high

c) complete square to get vertex

$$h(t) = -4.9(t^2 - 1.388t) + 3$$

$$b = -1.387755, -0.6939, 0.481466$$

$$h(t) = -4.9(t^2 - 1.388t + 0.481466 - 0.481466) + 3$$

$$h(t) = -4.9(t - 0.6939)^2 + 5.359$$

vertex $(0.6939, 5.359)$
 \uparrow time \uparrow max height (m)

Max height of 5.36m at 0.69s .

d) $h(t) = 0$ so $0 = -4.9(t - 0.6939)^2 + 5.359$

$$1.09367 = (t - 0.6939)^2$$

$$t - 0.6939 = \pm \sqrt{1.09367}$$

$$t = 0.6939 \pm 1.0458$$

$$t = 1.74, -0.35 \text{ reject}$$

diver hits water at 1.74s

e) D: $0 \leq t \leq 1.74\text{s}$

R: $0 \leq h \leq 5.359\text{m}$