Name: Key

8.7 Application-Vertical Motion

$$h = -16t^2 + vt + s$$

- t is time in seconds
- v is the initial upward velocity in feet per second **(negative if downward)**
- s is the initial height in feet
- h is height in feet

1) Lauren dove into a swimming pool from a 15-foot-high diving board with an initial upward velocity of 8 feet per second. Find the time t in seconds it took Lauren to enter the water. Use the model for vertical motion.

$h = -16t^2 + vt + s$

$0 = -16t^2 + 8t + 15$

$0 = 16t^2 + 8t - 240$

$0 = (4t+5)(4t-3)$

$-\frac{5}{4}$ or $\frac{3}{4}$

2) Jason jumped off of a cliff into the ocean in Acapulco while vacationing with some friends. His height as a function of time could be modeled by the function $h(t) = -16t^2 + 16t + 480$.

a. What is his velocity? Is it upward or downward?

16 ft/sec upward (positive)

b. What was his initial height?

480 ft

c. Jason hit the water after how many seconds?

$0 = -16(t^2 - t - 30)$

$t = 6, -5$

3) An outfielder in baseball attempts to throw out a runner from third base at home plan. He releases a baseball at a height of 6 feet with an initial velocity of 46 feet per second. Find the time (in seconds) for the ball to reach the catcher's mitt. (You can assume a perfect throw where the ball hits plate off the fly).

$0 = -16t^2 + 46t + 6$

$0 = \left(t - \frac{2}{-16}\right)\left(t + \frac{48}{-16}\right)$

$t = -\frac{1}{8}, 3$