Solve:

1) Starting at a height of 4 feet, a ball is thrown upwards with an initial velocity of 64 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 64t + 4$. Find the average velocity from $t = 4$ to $t = 5$.

$$\frac{s(5)-s(4)}{5-4} = \frac{-76-4}{5-4}$$

$$= \boxed{-80 \text{ ft./sec.}}$$

2) Starting at a height of 3 feet, a ball is thrown upwards with an initial velocity of 96 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 96t + 3$. Find the average velocity from $t = 0$ to $t = 4$.

$$\frac{s(4)-s(0)}{4-0} = \frac{131-3}{4}$$

$$= \boxed{32 \text{ ft./sec.}}$$

3) Starting at a height of 3 feet, a ball is thrown upwards with an initial velocity of 32 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 32t + 3$. Find the average velocity from $t = 1$ to $t = 2$.

$$\frac{s(2)-s(1)}{2-1} = \frac{3-19}{2}$$

$$= \boxed{-8 \text{ ft./sec.}}$$

4) Starting at a height of 3 feet, a ball is thrown upwards with an initial velocity of 32 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 32t + 3$. Find the velocity at $t = 1$.

$v(t) = s'(t)$

$v(t) = -32t + 32$

$v(1) = \boxed{0 \text{ ft./sec.}}$

5) Starting at a height of 1 foot, a ball is thrown upwards with an initial velocity of 32 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 32t + 1$. Find the velocity at $t = 2$.

$v(t) = -32t + 32$

$v(2) = \boxed{-32 \text{ ft./sec.}}$

6) Starting at a height of 3 feet, a ball is thrown upwards with an initial velocity of 64 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 64t + 3$. Find the velocity at $t = 1$.

$v(t) = -32t + 64$

$v(1) = \boxed{32 \text{ ft./sec.}}$

7) Given the position equation: $s(t) = 4t + 3$, find the instantaneous velocity at $t = 2$.

$v(t) = 4$

$v(2) = \boxed{4}$

8) Starting at a height of 3 feet, a ball is thrown upwards with an initial velocity of 128 feet/sec. The ball's height after t seconds is $s(t) = -16t^2 + 128t + 3$. Find the velocity at $t = 8$.

$v(t) = -32t + 128$

$v(8) = \boxed{-128 \text{ ft./sec.}}$

9) A manufacturer produces jars of peanut butter. The cost of producing x jars is C = f(x) dollars. $f(x) = 4x^2 - 5x$. Find the instantaneous rate of change of C with respect to x when x = 35.

$f'(x) = 8x - 5$

$f'(35) = \boxed{275 \text{ dollars/jar}}$

10) The number of people in Ohio affected by the flu over September is defined by N = f(x) where x is the day of the month. What are the units of f '(x)?

people/day

11) Given the position equation: $s(t) = -5t^3 - 3t^2 - 3t - 2$, find the average acceleration from t = 1 to t = 4.

$v(t) = -15t^2 - 6t - 3$

$\frac{v(4) - v(1)}{4-1} = \frac{-267 + 24}{3}$

$= \boxed{-81}$

12) Given the position equation: $s(t) = 3t^3 - 3t^2 + 3t + 3$, find the average acceleration from t = 3 to t = 5.

$v(t) = 9t^2 - 6t + 3$

$\frac{v(5) - v(3)}{5-3} = \frac{198 - 66}{2}$

$= \boxed{66}$

13) Given the position equation: $s(t) = -2t^3 + 3t^2 - 3$, find the instantaneous acceleration at t = 2.

$v(t) = -6t^2 + 6t$

$a(t) = -12t + 6$

$a(2) = \boxed{-18}$

14) Given the position equation: $s(t) = 3t^3 + 4t^2 - 4t - 2$, find the instantaneous acceleration at t = 0.

$v(t) = 9t^2 + 8t - 4$

$a(t) = 18t + 8$

$a(0) = \boxed{8}$

15) Given the position equation: $s(t) = t^3 + t^2 + 3t - 3$, find the instantaneous acceleration at t = 2.

$v(t) = 3t^2 + 2t + 3$

$a(t) = 6t + 2$

$a(2) = \boxed{14}$

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