

A rock is thrown off a cliff. Its distance from the ground below at t seconds is $s(t) = -16t^2 + 16t + 96$ feet.

- 1) What is the velocity after 1 second?
- 2) When will it hit the ground?
- 3) What is the velocity of the rock when it slams into the ground?
- 4) How high was the cliff?
- 5) A ball is thrown straight up. Its height at time t is represented by the equation $h = 30t - 50t^2$. Determine the instantaneous velocity of the ball at $t = 2$.
- 6) A ball is thrown straight up. Its height at time t is represented by the equation $h = 30t - 50t^2$. Determine the maximum height of the ball. (Hint: Consider the velocity of the ball at the moment the ball reaches its maximum height.)
- 7) A point P is moving along the x -axis. At any time t , the location of P on the x -axis is described by $x = t^3 - 4t^2 + 3t$. Determine the point's instantaneous velocity when $t = 5$.
- 8) A point P is moving along the x -axis. At any time t , the location of P on the x -axis is described by $x = t^3 - 4t^2 + 3t$. Determine the instantaneous acceleration at time $t = 5$ of the point P .

A manufacturer's profit from producing x units of a product is given by $P(x) = .002x^3 - .01x^2 + .5x$.

- 9) What is the marginal profit when the production level is at 50 units?
- 10) At what production level(s) will the marginal profit be \$9.30 per unit?

A winter storm front moves through campus. At t hours after the onset of the storm, the temperature is at $35 - 2t^2 + t$.

- 11) What is the temperature 3 hours after the storm begins?
- 12) At what rate is the temperature changing 3 hours after the storm begins?

Water is pouring into a tub such that after t minutes, there are $t^3 - t^2 + .3t$ gallons in the tub.

- 13) What is the average rate at which water pours into the tub over the first 4 minutes?
- 14) At what instantaneous rate is the water flowing when $t = 4$?

An automobile's brakes are applied at time $t = 0$ when the vehicle is traveling at 48 ft/sec. The brakes cause the automobile to decelerate so that after t sec the velocity is given by $v(t) = 48 - 16t$.

- 15) At what rate is the vehicle decelerating after 1 sec?
- 16) How long will it take for the vehicle to come to a complete stop?

Suppose that t hours after being placed in a freezer, the temperature of a piece of meat is given by $f(t) = 70 - 12t + \frac{4}{t+1}$.

17) What is the temperature of the meat after 3 hours?

18) How fast is the temperature of the meat falling 3 hours after being placed in the freezer?

Answer Key

Testname: SECTION1-7-8

- 1) -16 ft/sec
- 2) after 3 seconds
- 3) 80 ft/sec
- 4) 96 ft
- 5) -170
- 6) 4.5
- 7) 38
- 8) 22
- 9) \$14.50 per unit
- 10) 40 units
- 11) 20°
- 12) -11° per hour
- 13) 12.3 gal/min.
- 14) 40.3 gal/min.
- 15) 16 ft/sec²
- 16) 3 sec
- 17) 35°
- 18) 12.25° per hour