Classroom Voting Questions: Calculus I

4.6 Rates and Related Rates

1. If $\frac{dy}{dx} = 5$ and $\frac{dx}{dt} = -2$ then $\frac{dy}{dt} =$

   (a) 5
   (b) -2
   (c) -10
   (d) cannot be determined from the information given

2. If $\frac{dz}{dx} = 12$ and $\frac{dy}{dx} = 2$ then $\frac{dz}{dy} =$

   (a) 24
   (b) 6
   (c) 1/6
   (d) cannot be determined from the information given

3. If $y = 5x^2$ and $\frac{dx}{dt} = 3$, then when $x = 4$, $\frac{dy}{dt} =$

   (a) 30
   (b) 80
   (c) 120
   (d) $15x^2$
   (e) cannot be determined from the information given

4. The radius of a snowball changes as the snow melts. The instantaneous rate of change in radius with respect to volume is

   (a) $\frac{dV}{dr}$
   (b) $\frac{dr}{dV}$
   (c) $\frac{dV}{dr} + \frac{dr}{dV}$
   (d) None of the above

5. Gravel is poured into a conical pile. The rate at which gravel is added to the pile is

   (a) $\frac{dV}{dt}$

(b) $\frac{dr}{dt}$
(c) $\frac{dV}{dr}$
(d) None of the above

6. Suppose a deli clerk can slice a stick of pepperoni so that its length L changes at a rate of 2 inches per minute and the total weight W of pepperoni that has been cut increases at a rate of 0.2 pounds per minute. The pepperoni weighs:

   (a) 0.4 pounds per inch
   (b) 0.1 pounds per inch
   (c) 10 pounds per inch
   (d) 2.2 pounds per inch
   (e) None of the above

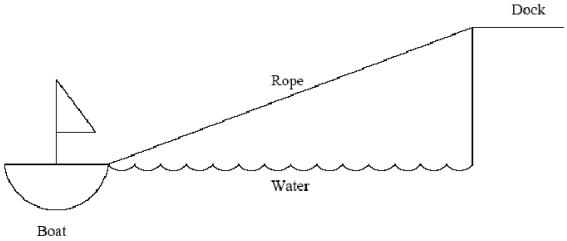
7. The area of a circle, $A = \pi r^2$, changes as its radius changes. If the radius changes with respect to time, the change in area with respect to time is

   (a) $\frac{dA}{dt} = 2\pi r$
   (b) $\frac{dA}{dt} = 2\pi r + \frac{dr}{dt}$
   (c) $\frac{dA}{dt} = 2\pi r \frac{dr}{dt}$
   (d) Not enough information

8. As gravel is being poured into a conical pile, its volume V changes with time. As a result, the height h and radius r also change with time. Knowing that at any moment $V = \frac{1}{3}\pi r^2 h$, the relationship between the changes in the volume, radius and height, with respect to time, is

   (a) $\frac{dV}{dt} = \frac{1}{3}\pi \left(2r\frac{dr}{dt}h + r^2\frac{dh}{dt}\right)$
   (b) $\frac{dV}{dt} = \frac{1}{3}\pi \left(2r\frac{dr}{dt} \cdot \frac{dh}{dt}\right)$
   (c) $\frac{dV}{dt} = \frac{1}{3}\pi \left(2rh + r^2\frac{dh}{dt}\right)$
   (d) $\frac{dV}{dt} = \frac{1}{3}\pi \left((r^2)(1) + 2r\frac{dr}{dh}h\right)$

9. A boat is drawn close to a dock by pulling in a rope as shown. How is the rate at which the rope is pulled in related to the rate at which the boat approaches the dock?



(a) One is a constant multiple of the other.

(b) They are equal.

(c) It depends on how close the boat is to the dock.

10. A boat is drawn close to a dock by pulling in the rope at a constant rate.

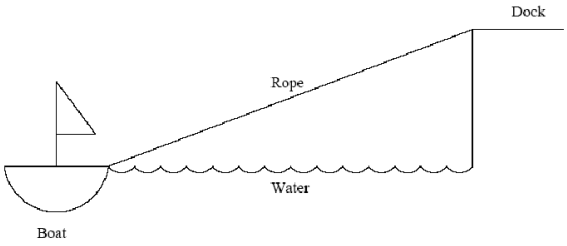
True or False: The closer the boat gets to the dock, the faster it is moving.

(a) True, and I am very confident

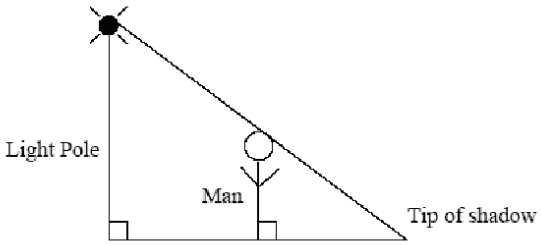
(b) True, but I am not very confident

(c) False, but I am not very confident

(d) False, and I am very confident



11. A streetlight is mounted at the top of a pole. A man walks away from the pole. How are the rate at which he walks away from the pole and the rate at which his shadow grows related?

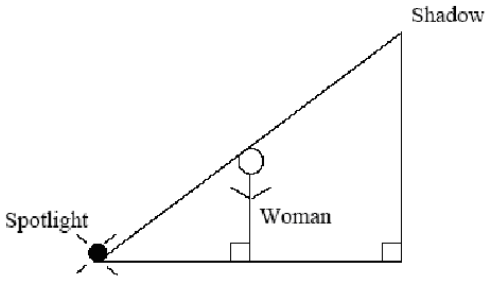


(a) One is a constant multiple of the other.

(b) They are equal.

(c) It depends also on how close the man is to the pole.

12. A spotlight installed in the ground shines on a wall. A woman stands between the light and the wall casting a shadow on the wall. How are the rate at which she walks away from the light and rate at which her shadow grows related?



(a) One is a constant multiple of the other.

(b) They are equal.

(c) It depends also on how close the woman is to the pole.