

# 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

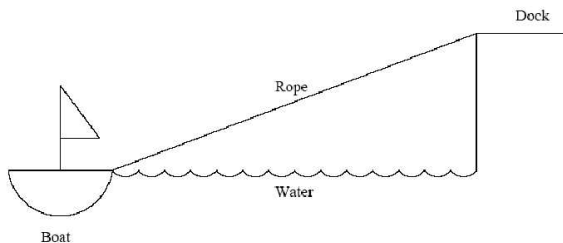
7. The area of a circle,  $A = \pi r^2$ , changes as its radius changes. If the radius changes with respect to time, the change in area with respect to time is

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

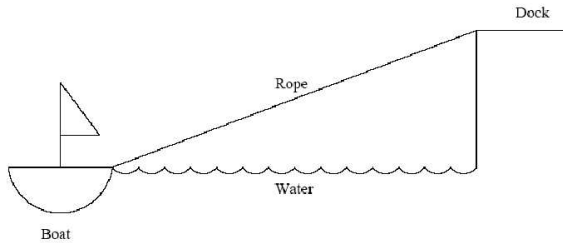
9. A boat is drawn close to a dock by pulling in a rope as shown. How is the rate at which the rope is pulled in related to the rate at which the boat approaches the dock?



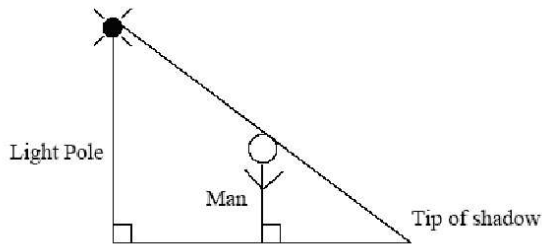
- (a) One is a constant multiple of the other.
- (b) They are equal.
- (c) It depends on how close the boat is to the dock.

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.

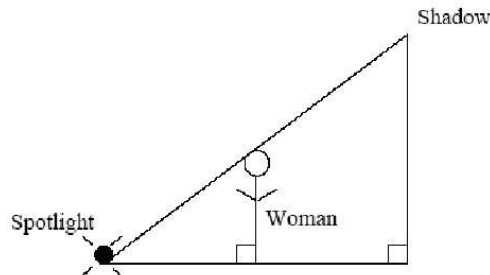


11. A streetlight is mounted at the top of a pole. A man walks away from the pole. How are the rate at which he walks away from the pole and the rate at which his shadow grows related?



- (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 man is to the pole.