

# Classroom Voting Questions: Calculus I

## 2.4 Interpretations of the Derivative

1. 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

2. 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

3. A slow freight train chugs along a straight track. The distance it has traveled after  $x$  hours is given by a function  $f(x)$ . An engineer is walking along the top of the box cars at the rate of 3 mi/hr in the same direction as the train is moving. The speed of the man relative to the ground is

(a)  $f(x) + 3$

(b)  $f'(x) + 3$

(c)  $f(x) - 3$

(d)  $f'(x) - 3$

4.  $C(r)$  gives the total cost of paying off a car loan that has an annual interest rate of  $r$ %. What are the units of  $C'(r)$ ?

(a) Year / \$

(b) \$ / Year

(c) \$ / %

(d) % / \$

5.  $C(r)$  gives the total cost of paying off a car loan that has an annual interest rate of  $r$ %. What is the practical meaning of  $C'(5)$ ?
- The rate of change of the total cost of the car loan is  $C'(5)$ .
  - If the interest rate increases by 1%, then the total cost of the loan increases by  $C'(5)$ .
  - If the interest rate increases by 1%, then the total cost of the loan increases by  $C'(5)$  when the interest rate is 5%.
  - If the interest rate increases by 5%, then the total cost of the loan increases by  $C'(5)$ .
6.  $C(r)$  gives the total cost of paying off a car loan that has an annual interest rate of  $r$ %. What is the sign of  $C'(5)$ ?
- Positive
  - Negative
  - Not enough information is given
7.  $g(v)$  gives the fuel efficiency, in miles per gallon, of a car going a speed of  $v$  miles per hour. What are the units of  $g'(v) = \frac{dg}{dv}$ ?
- (miles)<sup>2</sup>/[(gal)(hour)]
  - hour/gal
  - gal/hour
  - (gal)(hour)/(miles)<sup>2</sup>
8.  $g(v)$  gives the fuel efficiency, in miles per gallon, of a car going a speed of  $v$  miles per hour. What is the practical meaning of  $g'(55) = -0.54$ ?
- When the car is going 55 mph, the rate of change of the fuel efficiency decreases to 0.54 miles/gal.
  - When the car is going 55 mph, the rate of change of the fuel efficiency decreases by 0.54 miles/gal.
  - If the car speeds up from 55 to 56 mph, then the fuel efficiency is 0.54 miles per gallon.
  - If the car speeds up from 55 to 56 mph, then the car becomes less fuel efficient by 0.54 miles per gallon.