

# Classroom Voting Questions: Calculus I

## 2.5 The Second Derivative

1. The graph of  $y = f(x)$  is shown in figure 2.18. Which of the following is true for  $f$  on the interval shown?

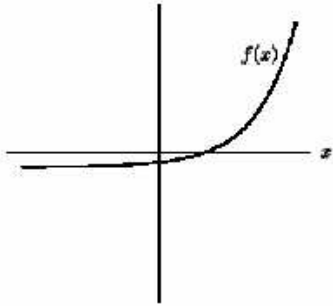


Figure 2.18

- i.  $f(x)$  is positive
  - ii.  $f(x)$  is increasing
  - iii.  $f'(x)$  is positive
  - iv.  $f'(x)$  is increasing
  - v.  $f''(x)$  is positive
- (a) i, ii, and iii only
- (b) ii, iii, and v only
- (c) ii, iii, iv, and v only
- (d) all are true
- (e) the correct combination of true statements is not listed here
2. **True or False:** If  $f''(x)$  is positive, then  $f(x)$  is concave up.
3. **True or False:** If  $f''(x)$  is positive, then  $f'(x)$  is increasing.
4. **True or False:** If  $f''(x)$  is increasing, then  $f(x)$  is concave up.
5. **True or False:** If the velocity of an object is constant, then its acceleration is zero.

6. In Figure 2.21, the second derivative at points  $a$ ,  $b$ , and  $c$ , respectively, is

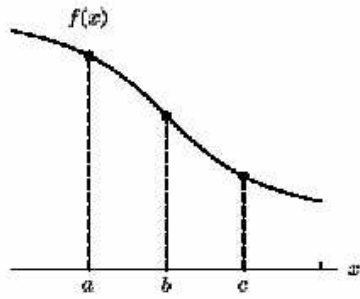


Figure 2.21

- (a) +, 0, -
- (b) -, 0, +
- (c) -, 0, -
- (d) +, 0, +
- (e) +, +, -
- (f) -, -, +

7. In figure 2.22, at  $x = 0$  the signs of the function and the first and second derivatives, in order, are

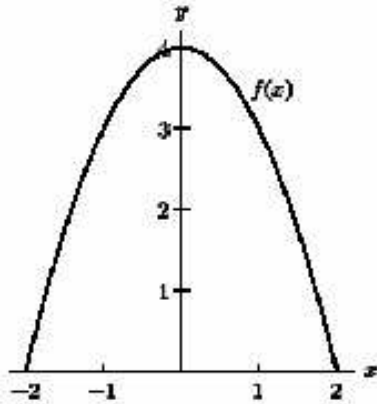
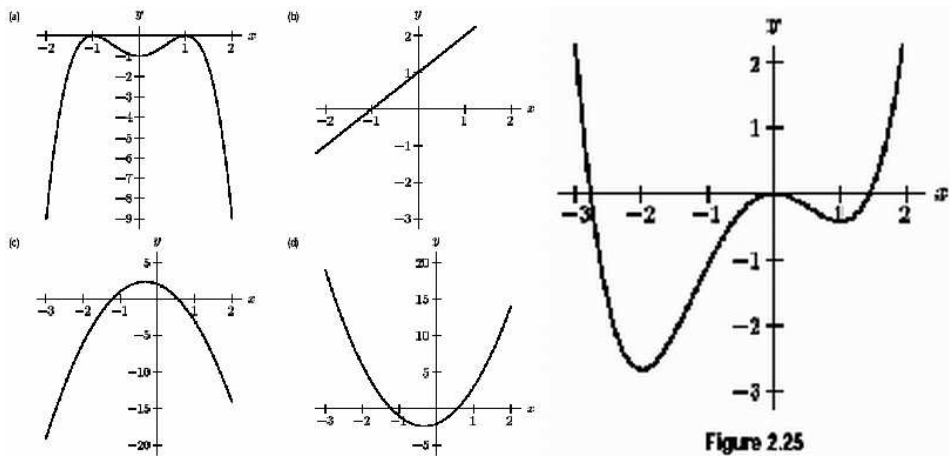


Figure 2.22

- (a) +, 0, +
- (b) +, 0, -
- (c) -, +, -
- (d) -, +, +
- (e) +, -, +
- (f) +, +, +

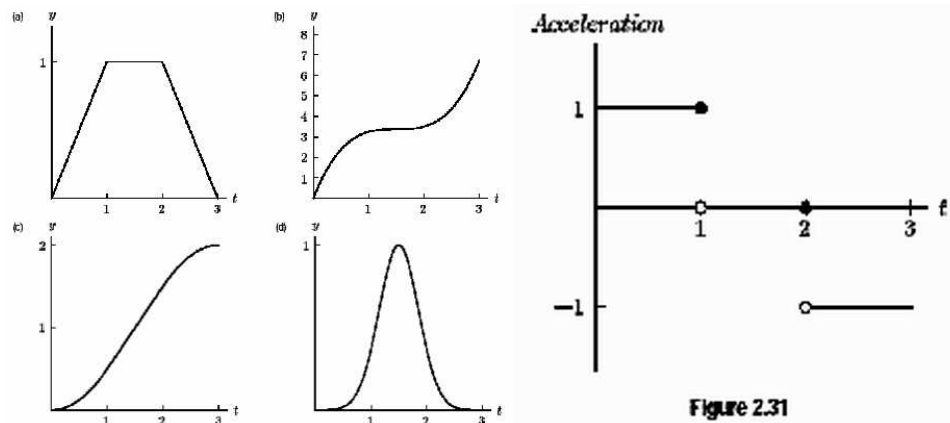
8. Which of the following graphs could represent the second derivative of the function shown in Figure 2.25?



9. If an object's acceleration is negative, at that particular instant the object can be

- (a) slowing down only.
- (b) speeding up only.
- (c) slowing down or momentarily stopped.
- (d) slowing down, momentarily stopped, or speeding up.

10. In *Star Trek: First Contact*, Worf almost gets knocked into space by the Borg. Assume he was knocked into space and his space suit was equipped with thrusters. Worf fires his thrusters for 1 second, which produces a constant acceleration in the positive direction. In the next second he turns off his thrusters. In the third second he fires his thruster producing a constant negative acceleration. The acceleration as a function of time is given in Figure 2.31. Which of the following graphs represent his position as a function of time?



11. The position of a moving car is given by the function  $s(t) = 3t^2 + 3$ , where  $t$  is in seconds, and  $s$  is in feet. What function gives the car's acceleration?

(a)  $a(t) = 3$

(b)  $a(t) = 6t$

(c)  $a(t) = 6$

(d)  $a(t) = 6t + 3$

(e)  $a(t) = 9$