Classroom Voting Questions: Calculus II

Section 6.3 Differential Equations

1. Find the solution to the differential equation \( \frac{dy}{dx} = 6x^2 \) if \( y(0) = 5 \).
   
   (a) \( y(x) = 12x + 5 \)
   (b) \( y(x) = 6x^2 + 5 \)
   (c) \( y(x) = 2x^3 + 5 \)
   (d) None of the above

2. Suppose you are told that the acceleration function of an object is a continuous function \( a(t) \). Let’s say you are given that \( v(0) = 1 \). True or False: You can find the position of the object at any time \( t \).
   
   (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

3. We know that \( \frac{d^2f}{dx^2} = 8e^x + 12 \), that \( f'(0) = 4 \), and \( f(0) = 10 \). What is \( f(x) \)?
   
   (a) \( f(x) = 8e^x + 6x^2 + 4x + 10 \)
   (b) \( f(x) = 8e^x + 6x^2 - 4x + 2 \)
   (c) \( f(x) = 8e^x + 12x^2 + 4x + 10 \)
   (d) \( f(x) = 8e^x + 12x^2 - 4x + 2 \)

4. True or False: If \( F(x) \) is an antiderivative of \( f(x) \), then \( y = F(x) \) is a solution to the differential equation \( \frac{dy}{dx} = f(x) \).
   
   (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
5. **True or False:** If \( y = F(x) \) is a solution to the differential equation \( \frac{dy}{dx} = f(x) \), then \( F(x) \) is an antiderivative of \( f(x) \).

   (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

6. **True or False:** If an object has constant nonzero acceleration, then the position of the object as a function of time is a quadratic polynomial.

   (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

7. **True or False:** If an object’s position as a function of time is a quadratic polynomial, then its acceleration is constant.

   (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

8. **True or False:** If \( F(x) \) and \( G(x) \) are two antiderivatives of \( f(x) \) for \(-\infty < x < \infty\) and \( F(5) > G(5) \), then \( F(10) > G(10) \).

   (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

9. **True or False:** If two solutions of a differential equation \( \frac{dy}{dx} = f(x) \) have different values at \( x = 3 \) then they have different values at every \( x \).

   (a) True, and I am very confident
   (b) True, but I am not very confident
10. **True or False:** If the function \( y = f(x) \) is a solution of the differential equation \( \frac{dy}{dx} = \sin(x) \), then the function \( y = f(x) + 5 \) is also a solution.

(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 car is traveling at a speed of 40 mph. How fast is this speed in feet per second?

(a) 211,200 ft/s
(b) 58.67 ft/s
(c) 3,520 ft/s
(d) 586.7 ft/s

12. A car goes from zero to 80 ft/s in 4 seconds. What is its acceleration?

(a) 10 ft/s^2
(b) 20 ft/s^2
(c) 30 ft/s^2
(d) 40 ft/s^2

13. An acrobat is tossed into the air at an upward speed of 40 ft/s. What is the acrobat’s velocity after 2 seconds?

(a) 40 ft/s
(b) -24 ft/s
(c) -32 ft/s
(d) -64 ft/s

14. An acrobat is tossed into the air at an upward speed of 40 ft/s. How high is the acrobat after 2 seconds?

(a) 80 ft
15. A car is traveling at a speed of 72 ft/s when the driver slams on the brakes, giving it a deceleration of 12 ft/s². How long does it take for the car to reach a stop?

(a) 2 s  
(b) 4 s  
(c) 6 s  
(d) 8 s  
(e) 12 s

16. A ball is thrown up into the air at a speed of 64 ft/s. How high will the ball get?

(a) 2 ft  
(b) 32 ft  
(c) 64 ft  
(d) 128 ft

17. A plane can accelerate from zero to 200 ft/s in 10 seconds. What distance will it cover before it reaches a speed of 200 ft/s?

(a) 10 ft  
(b) 100 ft  
(c) 1,000 ft  
(d) 10,000 ft

18. Looking over the edge of a canyon, we throw down a stone at a speed of 12 ft/s. When it hits the floor of the canyon, it is going at a speed of 140 ft/s. How deep is the canyon?

(a) 304 ft  
(b) 259 ft  
(c) 122 ft  
(d) 76 ft
19. A car goes from zero to 80 ft/s at a constant acceleration. When the car reaches 80 ft/s, it has traveled a distance of 200 ft. What was its acceleration?

(a) 4 ft/s^2
(b) 8 ft/s^2
(c) 16 ft/s^2
(d) 32 ft/s^2
(e) 200 ft/s^2

20. A car is driving at 100 ft/s when the driver suddenly slams on the brakes, slowing down at a constant deceleration to 20 ft/s, when the driver takes his foot off the brakes. The distance the car traveled while the brakes were on is 240 ft. What was the car's rate of deceleration?

(a) 6.7 ft/s^2
(b) 13.3 ft/s^2
(c) 20 ft/s^2
(d) 40 ft/s^2