Classroom Voting Questions: Calculus I

4.2 Optimization

1. **True or False:** If \( f(x) \) is continuous on a closed interval, then it is enough to look at the points where \( f'(x) = 0 \) in order to find its global maxima and minima.
   
   (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

2. **True or False:** A function defined on all points of a closed interval always has a global maximum and a global minimum.
   
   (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. Let \( f \) be a continuous function on the closed interval \( 0 \leq x \leq 1 \). There exists a positive number \( A \) so that the graph of \( f \) can be drawn inside the rectangle \( 0 \leq x \leq 1, \quad -A \leq y \leq A \).

   The above statement is:
   
   (a) Always true.
   (b) Sometimes true.
   (c) Not enough information.

4. Let \( f(x) = x^2 \). **True or False:** \( f \) has an upper bound on the interval \( (0, 2) \).

   (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. Let \( f(x) = x^2 \). **True or False:** \( f \) has a global maximum on the interval \((0, 2)\).

   (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. Let \( f(x) = x^2 \). **True or False:** \( f \) has a global minimum on the interval \((0, 2)\).

   (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. Let \( f(x) = x^2 \). **True or False:** \( f \) has a global minimum on any interval \([a, b]\).

   (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. Consider \( f(x) = -3x^2 + 12x + 7 \) on the interval \(-2 \leq x \leq 4\). Where does this function have its global maximum value?

   (a) \( x = -2 \)
   (b) \( x = 0 \)
   (c) \( x = 2 \)
   (d) \( x = 4 \)

9. Consider \( f(x) = -3x^2 + 12x + 7 \) on the interval \(-2 \leq x \leq 4\). Where does this function have its global minimum value?

   (a) \( x = -2 \)
   (b) \( x = 0 \)
   (c) \( x = 2 \)
   (d) \( x = 4 \)