Math 115 – Calculus I
Practice Problems – In-class Exam II
Fall 2010

The second in-class exam is on Wednesday, November 10

The exam will cover the following sections from the textbook.

- Chapter 4, Sections 4.1, 4.2, 4.3, 4.4, 4.5.
- Chapter 5, Sections 5.1, 5.2, 5.4.

These problems are intended to be used as part of a review for the exam. Do not confuse this, however, with a sample exam. The problems below are not a substitute for studying all the material covered in class and the homework assignments.

Circle the correct answer.

1. The function \( f(x) = x^3 - 6x^2 - 180x \) is decreasing on the interval

   \( (A) \ (-5, 10) \quad (B) \ (-5, 11) \quad (C) \ (-\infty, -5) \quad (D) \ (-6, 10) \quad (E) \ (10, +\infty) \)

2. The largest open intervals on which \( f(x) = x + \frac{1}{x} \) is increasing are

   \( (A) \ (-\infty, -1) \) and \( (0, \infty) \)
   \( (B) \ (-\infty, -1) \) and \( (1, \infty) \)
   \( (C) \ (-\infty, 0) \) and \( (1, \infty) \)
   \( (D) \ (-\infty, 0) \) and \( (0, \infty) \)
   \( (E) \) None of the above.

3. If a function \( f \) has derivative at every point \( x \) and the function has a relative maximum at \( x = -2 \) then

   \( (A) \ f'(-2) > 0 \quad (B) \ f'(-2) = 0 \quad (C) \ f(-2) > 0 \quad (D) \ f(-2) \) is not defined
   \( (E) \) None of the above.

4. Which of the following statements is true for the function \( f \) represented in the graph below in Figure 1?
5. Which of the following statements is true for the function $f$ represented in the graph below in Figure 2?

(A) $f' > 0$ on $(0, 2)$, $f'' > 0$ on $(0, 1)$ and $f'' < 0$ on $(1, 2)$.
(B) $f' > 0$ on $(0, 2)$, $f'' < 0$ on $(0, 1)$ and $f'' > 0$ on $(1, 2)$.
(C) $f' < 0$ on $(0, 2)$, $f'' > 0$ on $(0, 1)$ and $f'' < 0$ on $(1, 2)$.
(D) $f' < 0$ on $(0, 2)$, $f'' < 0$ on $(0, 1)$ and $f'' > 0$ on $(1, 2)$.
(E) None of the above
(A) \( f'' > 0 \) on \((0, 2)\), \( f \) has one inflection point and no critical point in \((0, 2)\).
(B) \( f'' > 0 \) on \((0, 2)\), \( f \) has no inflection point and one critical point in \((0, 2)\).
(C) \( f'' < 0 \) on \((0, 2)\), \( f \) has one inflection point and no critical point in \((0, 2)\).
(D) \( f'' < 0 \) on \((0, 2)\), \( f \) has no inflection point and one critical point in \((0, 2)\).
(E) None of the above

**Answer Problems 6 and 7 using the following information.**

A nature preserve is being established. A population biologist has estimated that the population of deer in the preserve is given by the model

\[ Q(t) = 150e^{0.05t} \]

where \( t \) is in years and \( t = 0 \) correspond to the time when the preserve was established.

6. The population of deer when the preserve is established is

(A) 3000 deer    (B) 75 deer    (C) 150 deer    (D) 300 deer    (E) 1500 deer

7. The rate of change of the population of deer five years after the preserve is established will be (computed to two decimal places)

(A) 9.63 deer/year    (B) 7.50 deer/year    (C) 8.52 deer/year    (D) 150.00 deer/year

(E) None of the above.

8. The market value of an office building located in the commercial district of a city is given by

\[ V(t) = 300,000e^{\frac{1}{2}\sqrt{t}} \]

where \( V(t) \) is measured in dollars and \( t \) is the time in years from the present. Then, the value of the property four years from now will be

(A) \$300,000    (B) \$150,000    (C) \$600,000    (D) \$424,264

(E) None of the above.

9. If \( 10^x = 10^{x+3} \), then \( x = \)

(A) 0    (B) 4    (C) 3    (D) −1

(E) None of the above.

10. \( \ln(xe^x) = \)

(A) \( \ln x + x \)

(B) \( x \ln x \)

(C) \( e^x + \ln x \)

(D) \( e^x \ln x \)

(E) None of the above.
11. If $12 - e^{2x} = 3$, then $x =$

$(A) - 3 \quad (B) \ln 3 \quad (C) \ln 9 \quad (D) - 3 \ln 9 \quad (E) \text{None of the above.}$

12. If $f(x) = 12 - e^{2x}$, then $f'(x) =$

$(A) 12 - e^{2x} \quad (B) - e^{2x} \quad (C) -2e^{2x} \quad (D) 12 - 2e^{2x} \quad (E) \text{None of the above.}$

13. The domain of the function $f(x) = \ln(x + 1)$ is

$(A) (0, +\infty) \quad (B) (1, +\infty) \quad (C) (-1, +\infty) \quad (D) (-\infty, +\infty) \quad (E) \text{None of the above.}$

14. The horizontal and vertical asymptotes of the graph $\frac{2x^2 + 1}{x^2 - x - 6}$ are

$(A) x = 2, y = 3, \text{ and } y = -2 \quad (B) y = 2, x = 3, \text{ and } x = -2 \quad (C) x = 3, y = 2, \text{ and } y = -2 \quad (D) x = \frac{1}{2} \text{ and } x = -\frac{1}{2} \quad (E) y = \frac{1}{2} \text{ and } y = -\frac{1}{2}$

15. The absolute maximum and absolute minimum values of $f(x) = \frac{x}{x^2 + 4}$ on $[0, 3]$ are

$(A) \frac{3}{13} \text{ and } 0 \quad (B) \frac{1}{4} \text{ and } 0 \quad (C) \frac{1}{4} \text{ and } \frac{3}{13} \quad (D) \frac{1}{5} \text{ and } 0 \quad (E) \text{None of the above}$

16. The price of certain stock at time $t$ $(0 \leq t \leq 5)$ is estimated by

$P(t) = 0.1t^3 + 0.05t^2 - 3t + 10.$

Then, the stock price will have

$(A) \text{maximum price at } t = 0 \text{ and minimum price at } t = 5. \quad (B) \text{maximum price at } t = 2 \text{ and minimum price at } t = 3. \quad (C) \text{maximum price at } t = 0 \text{ and minimum price at } t = 2. \quad (D) \text{maximum price at } t = 0 \text{ and minimum price at } t = 3 \quad (E) \text{None of the above.}$

17. Problems 43-46 Sec. 4.1.

18. Problems 9-12 Sec. 4.2.

19. Problems 1-10 Sec. 4.3.

20. Problems 1-8 Sec. 4.4.