Exam II - Math 141 Fall 2012

Name: _____ **Exam Version B**

**This exam is multiple choice. Make sure you fill in your answers on the scantron answer sheet provided. Fill in your name, student ID number, and the exam version on the scantron answer sheet. You may use this exam, and the blank pages provided, to work out the problems. You must hand in this exam as well as the scantron answer sheet. To hand in your exam, be prepared to show your picture ID. This is a closed book, closed notes exam. Calculators are allowed but must be equivalent to a TI-83/84; no TI-89s or equivalent are allowed. No cell phones are permitted outside of your bag at anytime during the test.**

1. If $f(x) = \dfrac{4x-10}{x^2+1}$, then $f'(x) =$

   (a) $\dfrac{(4x-10)(2x)-(x^2+1)(4)}{(x^2+1)^2}$

   (b) $\dfrac{4}{2x}$

   (c) $\dfrac{(x^2+1)(4)+(4x-10)(2x)}{(x^2+1)^2}$

   (d) $\dfrac{(x^2+1)(4)-(4x-10)(2x)}{(x^2+1)^2}$

   (e) none of the above

2. If $f(x) = 3x\sqrt{x+1}$, then $f'(x) =$

   (a) $3x(1/2)(x+1)^{-1/2} + (x+1)^{1/2}(3)$

   (b) $(x+1)^{-1/2}$

   (c) $3(1/2)(x+1)^{-1/2}$

   (d) $3x(1/2)(x+1)^{-1/2} + (x+1)^{-1/2}(3)$

   (e) none of the above

3. If $f(x) = \dfrac{2}{3}x^3 + \dfrac{5}{2}x^2 - 3x + 7$, then which statement is true for $f(x)$ on the interval $[0, 1]$?

   (a) There is an absolute maximum when $y = 20.5$.

   (b) When $x = -3$ there is an absolute maximum.

   (c) $y = 7$ is an absolute minimum occurring at $x = 0$

   (d) When $x = \frac{1}{2}$, the y-value is an absolute minimum.

   (e) none of the above

4. If $f(x) = \sqrt[4]{4x^2 - x}$, then $f'(x) =$

   (a) $\frac{1}{4}(4x^2 - x)^{-1/4}(8x - 1)$

   (b) $\frac{1}{4}(4x^2 - x)^{-3/4}(8x - 1)$

   (c) $\frac{1}{4}(8x - 1)^{-3/4}$

   (d) $\frac{1}{4}(4x^2 - x)^{-3/4}$

   (e) none of the above

5. If $f(x) = (3x^2 - x)^5(4x + 3)^{-2}$, then $f'(x) =$

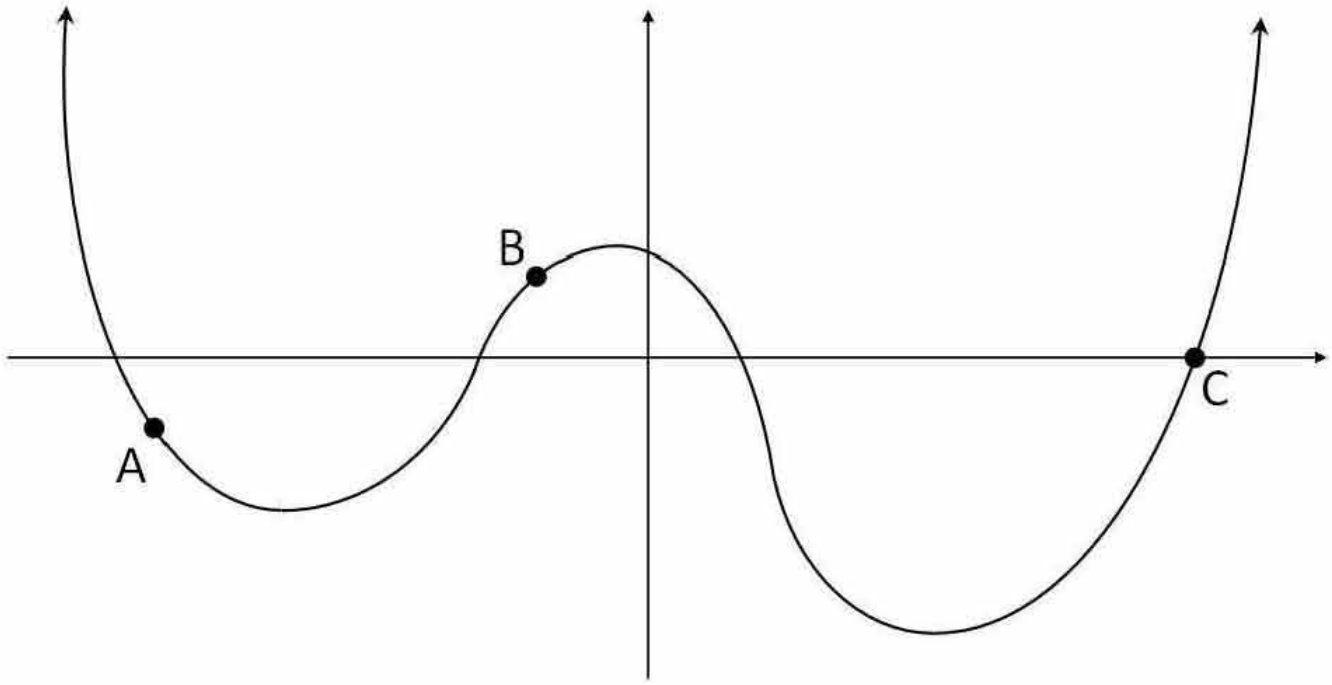
   (a) $5(3x^2 - x)^4(6x - 1)(-2)(4x + 3)^{-3}(4)$

   (b) $(3x^2 - x)^5(-2)(4x + 3)^{-3}(4) + (4x + 3)^{-2}5(3x^2 - x)^4(6x - 1)$

   (c) $(3x^2 - x)^5(-2)(4x + 3)^{-1}(4) + (4x + 3)^{-2}5(3x^2 - x)^4(6x - 1)$

   (d) $(3x^2 - x)^5(-2)(4x + 3)^{-3}(4) - (4x + 3)^{-2}5(3x^2 - x)^4(6x - 1)$

Use the following graph to answer questions 6 through 8.




6. At point A, which of the following are true?

   (a) $f(x)$ is positive, $f'(x)$ is positive, and $f''(x)$ is positive.
   (b) $f(x)$ is negative, $f'(x)$ is positive, and $f''(x)$ is positive.
   (c) $f(x)$ is negative, $f'(x)$ is negative, and $f''(x)$ is positive.
   (d) $f(x)$ is negative, $f'(x)$ is negative, and $f''(x)$ is negative.
   (e) None of the above.

7. At point B, which of the following are true?

   (a) $f(x)$ is positive, $f'(x)$ is positive, and $f''(x)$ is positive.
   (b) $f(x)$ is negative, $f'(x)$ is positive, and $f''(x)$ equals zero.
   (c) $f(x)$ is negative, $f'(x)$ is negative, and $f''(x)$ is positive.
   (d) $f(x)$ is positive, $f'(x)$ is positive, and $f''(x)$ is negative.
   (e) None of the above.

8. At point C, which of the following are true?

   (a) $f(x)$ is positive, $f'(x)$ is positive, and $f''(x)$ is positive.
   (b) $f(x)$ equals zero, $f'(x)$ is positive, and $f''(x)$ equals zero.
   (c) $f(x)$ equals zero, $f'(x)$ is positive, and $f''(x)$ is positive.
   (d) $f(x)$ equals zero, $f'(x)$ is negative, and $f''(x)$ is negative.
   (e) None of the above.

9. If $f(x) = x^4 - 3x^3 + x - 2$, then $f''(3) =$

   (a) 1
   (b) 28
   (c) 0
   (d) 18
   (e) 54

10. If the revenue, $R(x)$, and cost, $C(x)$, for the production and sale of $x$ units of a product are given by

$$R(x) = 5x - 2x^2, \quad C(x) = x^2 + 2,$$

    then the profit, $P(x)$, equals

   (a) $-3x^2 + 5x - 2$
   (b) $3x^2 + 5x + 2$
   (c) $-3x^2 + 5x + 2$
   (d) $3x^2 - 5x - 2$

**Use the function $P(x)$ from problem 7 to answer questions 8 through 10.**

11. Which of the following is the best interpretation of $P(10)$?

   (a) $P(10)$ is the exact profit of producing and selling only item 10.
   (b) $P(10)$ is the approximate profit of producing and selling items 1 through 10.
   (c) $P(10)$ is the approximate profit of producing and selling only item 10.
   (d) $P(10)$ is the exact profit of producing and selling items 1 through 10.

12. Which of the following is the best interpretation of $P'(10)$?

   (a) $P'(10)$ is the exact profit of producing and selling items 1 through 10.
   (b) $P'(10)$ is the approximate profit of producing and selling only item 11.
   (c) $P'(10)$ is the exact profit of producing and selling items 1 through 11.
   (d) $P'(10)$ is the approximate profit of producing and selling only item 10.

13. Which of the following would best approximate the profit of producing and selling the first 11 items?

   (a) $P(10) + P'(10)$
   (b) $P'(10)$
   (c) $P'(11)$
   (d) $P(10)$
   (e) $P(10) + P(1)$

14. The **difference** of two numbers is 24. What two numbers **minimize** the product?

    (a) 36 and 12
    (b) 24 and 0
    (c) 6 and $-18$
    (d) 12 and 12
    (e) 12 and $-12$

15. Which one of the following equations would you use to find critical values?

    (a) $f''(x) = 0$
    (b) $f'(x) = 0$
    (c) $f(x) = 0$
    (d) $f(x) = f'(x)$
    (e) None of the above.

16. Suppose $f(x)$ has only one critical value at $x = 10$. If $f'(9)$ is positive and $f'(12)$ is negative, there is

    (a) not enough information to tell
    (b) an inflection point at $x = 10$
    (c) a relative minimum at $x = 10$
    (d) a relative maximum at $x = 10$

17. What are the inflection points of $g(x) = x^4 - 4x^3$?

    (a) $x = 0$ and $x = 3$
    (b) $x = 2$ only
    (c) $x = 0$, and $x = 2$
    (d) $x = 0$ only
    (e) $x = 3$

18. The critical values of $h(x)$ are $x = -2$, $x = 0$, and $x = 5$, and the first derivative of $h(x)$ is $\mathbf{h'(x) = x^3 - 3x^2 - 10x}$.

    (a) $h(x)$ has a local minimum at $x = 5$, and local maxima at $x = -2$, and $x = 0$.
    (b) $h(x)$ has a local minimum at $x = -2$, a local maximum at $x = 5$, and neither at $x = 0$.
    (c) $h(x)$ has local maxima at $x = -2$, $x = 0$, and $x = 5$, and no local minima.
    (d) $h(x)$ has local minima at $x = -2$ and $x = 5$ and a local maximum at $x = 0$.
    (e) None of the above

19. You wish to build a rectangular fence on the side of your house. Since one side of the fence will be built directly up against your house, you only need to build 3 sides to make an enclosure. You have 36 feet of fencing. What are the width and length of the fence that maximize the area built?

    (a) 6 feet $\times$ 12 feet

    (b) 12 feet $\times$ 12 feet

    (c) 3 feet $\times$ 30 feet

    (d) 3 feet $\times$ 24 feet

    (e) 9 feet $\times$ 18 feet

20. Given $f(4) = -10$, $f'(4) = 0$, and $f''(4) = 3$, there is

    (a) an inflection point at $x = 4$

    (b) a relative maximum at $x = 4$

    (c) a relative minimum at $x = 4$

    (d) not enough information to tell