

DEPARTMENTAL FINAL EXAMINATION
Spring 2010

MATH-M 119
BRIEF SURVEY OF CALCULUS

Directions

- **DO NOT OPEN** this test booklet until you are asked to do so.
- There are seven pages on this exam with 20 problems – You **MUST** get a new exam from the proctor if your exam is incomplete.
- **PRINT** your name and student ID# and check your section below.
- You have two hours to complete this examination.

NO scrap paper, notes, books, nor graphing calculators allowed.
Cell phones should be OFF. Earpieces are not permitted.

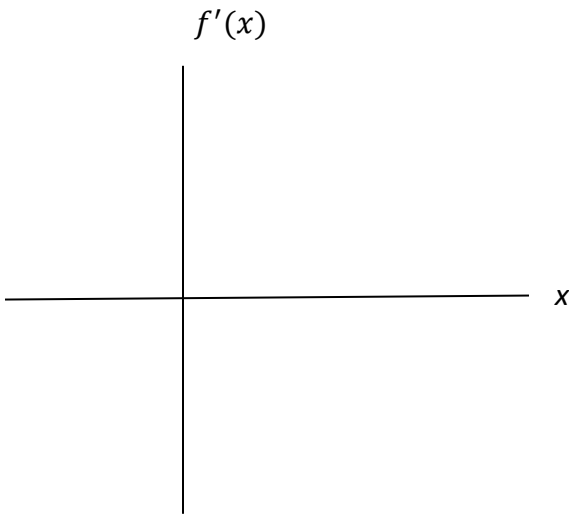
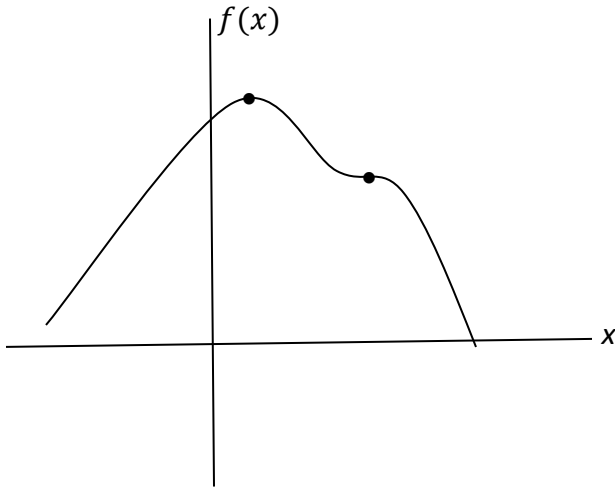
Neatness counts! To receive credit show supporting work.

NAME <small>(Print Clearly)</small>	
UNIV ID#	

check your section here

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20	(8)	
TOTAL	(50)	

1. Sketch a graph of the first derivative $f'(x)$ for the function $f(x)$ depicted below. Make certain that your sketch shows x -intercepts exactly where you want them to be. Also make sure your graph of $f'(x)$ is above (below) the x -axis just when it's supposed to be.



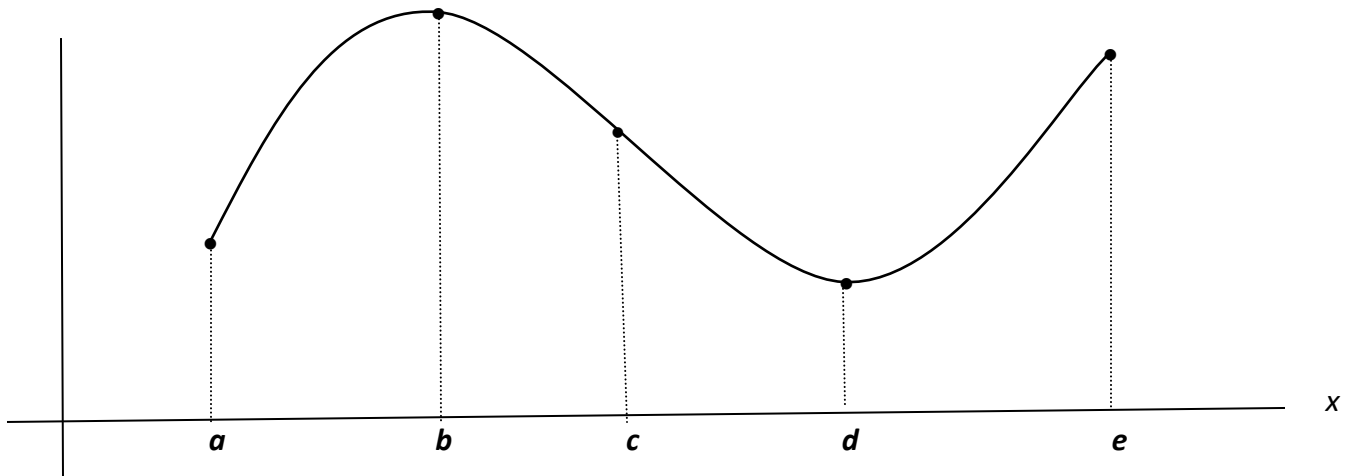
(2)

2. Suppose that $f(x)$ is a function with $f(100) = 62$ and $f'(100) = -0.4$. Use a local linear approximation to estimate $f(95)$.

2. $f(95) \cong$ _____

(2)

3. Refer to the graph of the function $y = f(x)$ over the interval $[a, e]$



A. List the point(s) on the x -axis where $f'(x) = 0$

B. List the point(s) on the x -axis where $f''(x) = 0$

- Express intervals in the form $a < x < b$ or (a, b) your preference of notation.

C. Find all intervals on which $f'(x) < 0$

D. Find all intervals on which $f''(x) > 0$

(4)

4. Given $s = \ln t$ Evaluate $\left. \frac{ds}{dt} \right|_{t=20}$

4. _____ (2)

5. Given $y = f(x) = 10^x$ Approximate to 4 decimal places $f'(3)$.

5. _____ (2)

6. Given $y = f(x) = e^{5x}$ Determine $f''(x)$

6. _____ (2)

7. Let $y = \frac{1}{x} + 2\sqrt{x} - 3$. Compute $\frac{dy}{dx}$.

7. _____ (2)

8. Find the derivative of the function $y = x^5 \cdot \ln x$

8. _____ (2)

9. Find the derivative of the function $w = (3x^2 + x)^8$

9. _____ (2)

10. Find an equation of the tangent line to the curve $y = f(x) = x^3 - x^2$ at $x = 2$.

10. _____ (2)

11. Find the quantity q which maximizes profit if the total revenue and total cost (in dollars) are given by

$$R(q) = 450q$$

$$C(q) = 10,000 + 3q^2$$

11. _____ (2)

12. The demand for a product is given by $q = 800 - (0.2)p$ where p is the price of the product in dollars. What price will maximize revenue?

12. _____ (2)

13. Consider a function defined over the entire real line such that $f'(x) = -2x + 15$

(a) When (over what interval) is f increasing? 13(a) _____ (1)

(b) When (over what interval) is f decreasing? 13(b) _____ (1)

14. Find an anti-derivative $F(x)$ for the function $f(x) = 570e^{(.04)x}$

14. _____ (2)

15. Find the indefinite integral $\int t^{-1} dt$

15. _____ (2)

16. Find a particular anti-derivative $F(x)$ for the function $f(x) = e^x$ that also satisfies the initial condition $F(0) = 10$.

16. $F(x) =$ _____ (2)

17. Evaluate $\int_9^{100} \frac{1}{\sqrt{x}} dx$

17. _____ (3)

18. Using a definite integral find the area of the region below the curve and above the x -axis for the inverted parabola: $y = f(x) = -3x^2 + 12x$.

18. _____ (3)

19. The marginal cost of a product is $C'(q) = (0.03)q + 0.1$ dollars. The fixed costs are \$1,500. What is the total cost to produce 1000 items?

19. _____ (2)

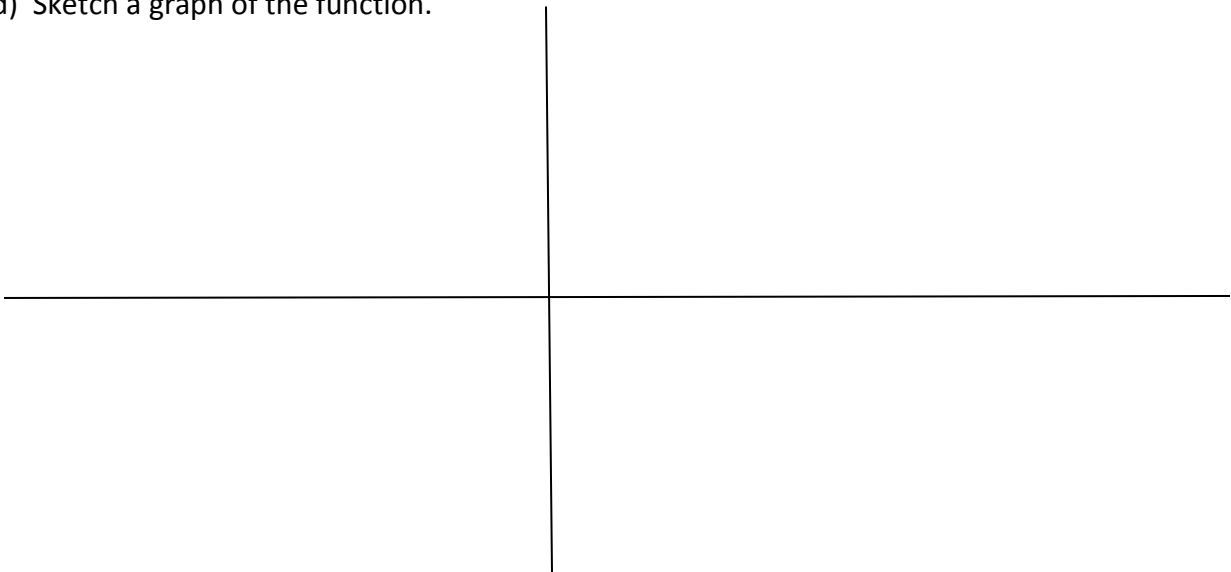
20. Consider the polynomial $y = f(x) = -x^3 + 6x^2$ restricted to the interval $[-1, 7]$
For your convenience: $f'(x) = -3x^2 + 12x$ and $f''(x) = -6x + 12$

(a) Find any critical points (Make sure you find both 1st and 2nd coordinate for these critical points)

(b) Use the 1st or 2nd derivative test to classify these critical points as local max or local min

(c) Find any global max or global min

(d) Sketch a graph of the function.



(2)

(2)

(2)

(2)
8