

MATH 140A
EXAMINATION III
NOVEMBER 18, 2002

NAME _____
STUDENT NUMBER _____
INSTRUCTOR _____
SECTION NUMBER _____

The examination consists of **20** multiple choice questions. For this exam calculators are **not** allowed and are not needed. For each problem, please fill in the bubble on the scantron sheet and circle the correct answer on your examination. Each problem is worth five points.

**THE USE OF CALCULATORS IS NOT PERMITTED
IN THIS EXAMINATION.**

CHECK THE EXAMINATION BOOKLET BEFORE
YOU START. THERE SHOULD BE **20** PROBLEMS
ON **11** PAGES (INCLUDING THIS ONE).

5 pts 1. $x \rightarrow \infty \frac{2x^2 - x + 1}{x^2 - 1}$ is

a) 1

b) $\frac{1}{2}$

c) 3

d) 2

e) 4

5 pts 2. Determine which of the following functions has vertical asymptote(s)

I. $\frac{\sin x}{x}$ II. $\frac{\cos x}{x}$ III. $\frac{x^2 - 1}{x + 1}$

only I and II.

only II.

only I and III.

only III.

none of these.

5 pts 3. Suppose $f'(x) = \frac{(x-2)^2 x^3}{x+1}$, find the interval(s) on which $y = f(x)$ is increasing.

- a) $(-\infty, -1)$
- b) $(-\infty, -1) \& (0, 2) \& (2, \infty)$
- c) $(-1, 0) \& (2, \infty)$
- d) $(-\infty, -1) \& (2, \infty)$
- e) $(-1, 0) \& (0, 2)$

5 pts 4. Suppose $f''(x) = \frac{(x-3)^2(7-x)}{(x-1)^{\frac{1}{3}}}$. Find the x coordinate of all inflection points of $y = f(x)$.

- a) $x = 1, x = 3, x = 7$
- b) $x = 3, x = 7$
- c) $x = 7$
- d) $x = 1, x = 7$
- e) $x = \frac{1}{3}, x = 1, x = 7$

5 pts 5. The graph of $y = f^1(x)$ is

Which best approximates the graph of $y = f(x)$.

5 pts 6. Suppose $f(2) = 1$, $f'(2) = 2$, then linear approximation of $f(x)$ at $2 \cdot 2 (< (2 \cdot 2))$ is

a) $2 \cdot 1$

b) $4 \cdot 1$

c) $1 \cdot 4$

d) 2

e) $2 \cdot 4$

5 pts 7. Starting with an approximation $x_0 = 1$, find the next approximation x_1 of the solution of $x^4 - x - 2 = 0$, using Newton's Method.

a) $\frac{1}{3}$

b) $\frac{5}{2}$

c) $-\frac{1}{2}$

d) $\frac{5}{3}$

e) 5

5 pts 8. The acceleration of a body moving along a co-ordinate line is $a(t) = 16t - 1$. Find its velocity $v(t)$, if $v(0) = 5$

a) $16t^2 - t + 5$

b) $8t^2 - t + 5$

c) $16t^2 - t$

d) $8t^2 - t$

e) $4t^2 - 2t$

5 pts 9. Evaluate $\int 3x^2 + \frac{2}{x^3} dx$

a) $3x^3 + \frac{1}{x^2} + c$

b) $x^3 + \frac{1}{x^2} + c$

c) $x^3 - \frac{1}{x^2}$

d) $x^3 + \frac{2}{x^2} + c$

e) $x^3 - \frac{1}{x^2} + c$

5 pts 10. The product of two non-negative numbers x, y is 18. Find minimum possible sum $2x + y$.

- a) 12
- b) 8
- c) 9
- d) 0
- e) 6

5 pts 11. Suppose $f(x) = 2x^3 - 18x$, Find x -coordinates of local maximum and local minimum

- a) Local maximum at $x = 3$; local minimum at $x = -3$
- b) No local maximum; local minimum at $x = -\sqrt{3}$
- c) Local maximum at $x = \sqrt{3}$; local minimum at $x = -\sqrt{3}$
- d) Local maximum at $x = -\sqrt{3}$; local minimum at $x = \sqrt{3}$
- e) No local maximum; No local minimum.

3 pts 12. If $f''(c) = 0$ then f must have an inflection at c .

a) True

b) False

3 pts 13. If $f'(c) = 0$, and $f''(c) < 0$, then f must have a local maximum at $x = c$.

a) True

b) False

3 pts 14. $\int \pi^3 dx = \frac{\pi^4}{4} + c$

a) True

b) False

3 pts 15. If f has a local minimum at $x = c$, then f^1 must exist at $x = c$, and $f^1(c) = 0$.

a) True

b) False

3 pts 16. If $f(x)$ and $g(x)$ are POSITIVE and INCREASING functions on an interval I , then there product $f(x)g(x)$ must be increasing on I .

a) True

b) False

- 10 pts 17. The Highway dept. is planning to build a picnic area along a major highway. It is to be rectangular with an area of 150 square yards and is to be fenced off on the three sides not adjacent to the highway. The cost of fence for the sides perpendicular to highway is \$1 per sq. yd. and cost of fence for the side parallel to highway is \$3 per sq. yd. What are the dimensions of fence that can minimize the cost.

10 pts 18. Evaluate the following Integrals

a) $\int 1 + \tan^2 \theta d\theta$

b) $\int \sin^2 x dx$

10 pts 19. Sketch the graph of $f(x)$, given the following information, clearly label all intercepts and asymptotes.

- a) The x -intercepts are $1, -1$.
- b) $f(2) = -2$.
- c) The function is symmetric about y -axis.
- d) $f'(x) < 0$ on $(0, 2)$
 $f'(x) > 0$ on $(2, \infty)$
- e) $f''(x) < 0$ on $(3, \infty)$
 $f''(x) > 0$ on $(0, 3)$
- f) $\lim_{x \rightarrow 0^+} f(x) = +\infty$
- g) $\lim_{x \rightarrow \infty} f(x) = 1 - 1$