Name: _____

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Multiple Choice

1.(5 pts.) If

$$f'(x) = \frac{(x-1)^2 x}{(x+1)^3} \ ,$$

find the local maxima and minima of $f(x)$ assuming that the domain of $f(x)$ is all $x \neq -1$.
Note: you are given f', not f.

(a) f has a local minimum at $x = 0$; f has local maxima at $x = 1$ and $x = -1$.

(b) There are no local minima or local maxima.

(c) f has a local minimum at $x = 0$; there is no local maximum.

(d) f has a local minimum at $x = 0$; f has a local maximum at $x = 1$.

(e) f has a local minimum at $x = 1$; f has a local maximum at $x = -1$.

2.(5 pts.) If

$$f'(x) = \frac{x}{1+x^2}$$

and if $f(x)$ is defined for all x, find the x coordinates of the points of inflection.
Note: you are given f', not f or f''.

(a) Not enough information is given to find the points of inflection.

(b) $x = 1$.

(c) $x = 0$.

(d) $x = -1$ and $x = 1$.

(e) There are no points of inflection.

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3.(5 pts.) If

$$y = \frac{\sqrt[3]{3x^3 + 2x + 3}}{2x + 4} \ ,$$

find the horizontal and vertical asymptotes.

(a) $y = \dfrac{4}{3}$ is a horizontal asymptote; $x = 2$ is a vertical asymptote.

(b) There are no horizontal asymptotes; $x = -2$ is a vertical asymptote.

(c) $y = \dfrac{3}{2}$ is a horizontal asymptote; $x = -2$ is a vertical asymptote.

(d) $y = 0$ is a horizontal asymptote; $x = -2$ is a vertical asymptote.

(e) $y = \dfrac{\sqrt[3]{3}}{2}$ is a horizontal asymptote; $x = -2$ is a vertical asymptote.

4.(5 pts.) Which formula below is the limit of Riemann sums for $\displaystyle\int_0^1 (1 - x^2)dx$ using the **left-hand-end-point** Riemann sums?

(a) $\displaystyle\lim_{n\to\infty} \sum_{i=0}^{n-1} \left(1 - \frac{i^2}{n^2}\right) \cdot \frac{1}{n}$

(b) $\displaystyle\lim_{n\to\infty} \sum_{i=0}^{n} \left(1 - \frac{i^2}{n^2}\right) \cdot \frac{1}{n}$

(c) $\displaystyle\lim_{n\to\infty} \sum_{i=0}^{n-2} \left(1 - \frac{i^2}{n^2}\right) \cdot \frac{1}{n}$

(d) $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \left(1 - \frac{i^2}{n^2}\right) \cdot \frac{1}{n}$

(e) $\displaystyle\lim_{n\to\infty} \sum_{i=2}^{n} \left(1 - \frac{i^2}{n^2}\right) \cdot \frac{1}{n}$

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5.(5 pts.) Calculate the following indefinite integral

$$\int \frac{x^2+1}{\sqrt{x}}dx =$$

(a) $\dfrac{\frac{x^3}{3}+x}{\frac{2}{3}x^{\frac{3}{2}}}+C.$ (b) $\frac{2}{5}x^{\frac{5}{2}}+2x^{\frac{1}{2}}+C.$ (c) $\frac{2}{5}x^{\frac{5}{2}}+2x^{\frac{1}{2}}.$

(d) $\frac{2}{5}x^{\frac{5}{2}}+\frac{2}{3}x^{\frac{1}{2}}.$ (e) $\frac{2}{5}x^{\frac{5}{2}}+\frac{2}{3}x^{\frac{1}{2}}+C.$

6.(5 pts.) Calculate the following definite integral

$$\int_0^3 |x-1|dx =$$

(a) $\frac{5}{2}.$ (b) $-2.$ (c) $\frac{9}{2}.$ (d) $\frac{3}{2}.$ (e) $1.$

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7.(5 pts.) Let $g(x) = \int_2^{\sec x} \sqrt{1+t^2}\, dt$ with $0 \le x \le \frac{\pi}{3}$. What is $g'(x)$?

(a) $\left(\sqrt{1+\sec^2 x}\right) \sec x \tan x.$

(b) $g'(x)$ does not exist.

(c) $\left(\sqrt{1+x^2}\right) \sec x \tan x.$

(d) $\sqrt{1+\sec^2 x}.$

(e) $\left(\sqrt{1+\sec^2 x}\right) \tan^2 x.$

8.(5 pts.) What is the indefinite integral

$$\int x\sqrt{x-1}dx = ?$$

(a) $\frac{x^3}{3} - \frac{x^2}{2} + C.$

(b) $\frac{2}{5}x^{\frac{5}{2}} + \frac{2}{3}x^{\frac{3}{2}}.$

(c) $\frac{2}{5}x^{\frac{5}{2}} + \frac{2}{3}x^{\frac{3}{2}} + C.$

(d) $\frac{2}{5}(x-1)^{\frac{5}{2}} + \frac{2}{3}(x-1)^{\frac{3}{2}}.$

(e) $\frac{2}{5}(x-1)^{\frac{5}{2}} + \frac{2}{3}(x-1)^{\frac{3}{2}} + C.$

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9.(5 pts.) Find the definite integral

$$\int_{-1}^{1} x^3(x^2+1)^2\,dx\ .$$

(a) $\frac{17}{12}$. (b) $\frac{17}{24}$. (c) 2. (d) 0. (e) 1.

10.(5 pts.) Let $A = \int_0^1 \frac{x}{x+1}dx$. Which of the following is true of A?

(a) $\frac{1}{2} \le A \le \frac{3}{4}$. (b) $\frac{-1}{4} \le A \le 0$. (c) A is undefined.

(d) $0 \le A \le \frac{1}{2}$. (e) $A = 0$.

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Partial Credit

You must show your work on the partial credit problems to receive credit!

11.(10 pts.) Answer the 8 questions, 1, 1a)-1c) and 2, 2a)-2c) below, and use your answers to graph

$$y = x + 2\cos x$$

on the interval $[0, 2\pi]$? Use the back of the previous page for your calculations.

1) $y' =$ _____
   a) On what interval(s) is y decreasing? _____
   b) Give both coordinates of any local maxima. _____
   c) Give both coordinates of any local minima. _____
2) $y'' =$ _____
   a) On what interval(s) is y concave down? _____
   b) Give both coordinates of any points of inflection. _____
   c) Give the slope of the tangent line at any points of inflection._____

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=1600

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Instructor: _____

12.(10 pts.) A ball is thrown upward from a height of 256 feet above the ground, with an initial velocity of 96 feet per second. The velocity of the ball at time t is $96 - 32t$ feet per second.

(a) Find $s(t)$, the function giving the height of the ball at time t.

(b) How long will the ball take to reach the ground?

(c) How high will the ball go?

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13.(10 pts.) Calculate the area bounded by the curves $y = x^2 + 2x + 3$ and $y = 2x + 4$.

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14.(10 pts.) An open rectangular box (that is, a box with no top) with square base and with a volume of 125 cubic feet is needed. Material for the base costs \$6 per square foot, and material for the sides costs \$3 per square foot. **Determine the dimensions** of the box that will minimize the cost of materials. *Justify that your answer is a minimum.*

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15.(10 pts.) **Determine the dimensions** of the rectangle of the largest area that can be inscribed in a right triangle with base 10 centimeters and height 20 centimeters. *Justify that your answer is a maximum.*

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Name: ANSWERS

Instructor: ANSWERS

Exam III
December 3, 2002

- The Honor Code is in effect for this examination. All work is to be your own.
- No calculators.
- The exam lasts for one hour.
- Be sure that your name is on every page in case pages become detached.
- Be sure that you have all 11 pages of the test.

Good Luck!

PLEASE MARK YOUR ANSWERS WITH AN X, not a circle!

1.	(a)	(b)	(•)	(d)	(e)
2.	(a)	(b)	(c)	(•)	(e)
3.	(a)	(b)	(c)	(d)	(•)
4.	(•)	(b)	(c)	(d)	(e)
5.	(a)	(•)	(c)	(d)	(e)
6.	(•)	(b)	(c)	(d)	(e)
7.	(•)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(•)
9.	(a)	(b)	(c)	(•)	(e)
10.	(a)	(b)	(c)	(•)	(e)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

15. _____

Total: _____

Name: _____

Instructor: _____

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December 3, 2002

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1.	(a)	(b)	(c)	(d)	(e)
2.	(a)	(b)	(c)	(d)	(e)
3.	(a)	(b)	(c)	(d)	(e)
4.	(a)	(b)	(c)	(d)	(e)
5.	(a)	(b)	(c)	(d)	(e)
6.	(a)	(b)	(c)	(d)	(e)
7.	(a)	(b)	(c)	(d)	(e)
8.	(a)	(b)	(c)	(d)	(e)
9.	(a)	(b)	(c)	(d)	(e)
10.	(a)	(b)	(c)	(d)	(e)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

15. _____

Total: _____