Name: _____

Instructor: _____

## Multiple Choice

**1.**(5 pts.) If

$$f'(x) = \frac{(x-1)^3 x}{(x+1)^4} \ ,$$

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) There are no local minima or local maxima.

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

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

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

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

**2.**(5 pts.) If

$$f'(x) = \frac{x}{1+4x^2}$$

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) There are no points of inflection.

(b) $x = 0$.

(c) $x = -\frac{1}{2}$ and $x = \frac{1}{2}$.

(d) $x = \frac{1}{2}$.

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

Name: _____

Instructor: _____

**3.**(5 pts.) If

$$y = \frac{\sqrt[5]{32x^5 + 12x + 3}}{2x + 4} \ ,$$

find the horizontal and vertical asymptotes.

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

(b) $y = \dfrac{\sqrt[5]{12}}{2}$ is a horizontal asymptote; $x = -2$ is a vertical asymptote.

(c) $y = 1$ is a horizontal asymptote; $x = -2$ is a vertical asymptote.

(d) $y = \dfrac{\sqrt[5]{12}}{4}$ is a horizontal asymptote; $x = 2$ is a vertical asymptote.

(e) There are no horizontal asymptotes; $x = -2$ 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 **right-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) $\displaystyle\lim_{n\to\infty} \sum_{i=0}^{n-2} \left(1 - \frac{i^2}{n^2}\right) \cdot \frac{1}{n}$

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

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

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

Name: _____

Instructor: _____

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

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

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

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

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

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

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

Name: _____

Instructor: _____

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

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

(b) $\sqrt{1+\tan^2 x}$.

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

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

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

**8.**(5 pts.) What is the definite integral

$$\int_1^2 x\sqrt{x-1}dx = ?$$

(a) $\frac{16}{15}$.

(b) $\frac{15}{19}$.

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

(d) $\frac{19}{15}$.

(e) $\frac{15}{16}$.

Name: _____

Instructor: _____

**9.**(5 pts.) Find the definite integral

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

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

**10.**(5 pts.) Let $A = \int_0^1 \frac{x^2}{x^2+1} dx$. Which of the following is true of $A$?

(a) $A$ is undefined. (b) $0 \leq A \leq \frac{1}{2}$. (c) $A = 0$.

(d) $\frac{1}{2} \leq A \leq \frac{3}{4}$. (e) $\frac{-1}{4} \leq A \leq 0$.

Name: _____

Instructor: _____

**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

$$y = x - 2\sin x$$

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._____

:graphs:BlankGraph.eps

=1600

Name: _____

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?

Name: _____

Instructor: _____

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

Name: _____

Instructor: _____

**14.**(10 pts.) An open rectangular box (that is, a box with no top) with square base and with a volume of 27 cubic feet is needed. Material for the base costs \$4 per square foot, and material for the sides costs \$2 per square foot. **Determine the dimensions** of the box that will minimize the cost of materials. *Justify that your answer is a minimum.*

Name: _____

Instructor: _____

**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.*

:graphs:MaxMin.eps

=1600

Name: ANSWERS

Instructor: ANSWERS

Exam III, Makeup

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

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

11. _____

12. _____

13. _____

14. _____

15. _____

**Total:** _____

Name: _____

Instructor: _____

Exam III, Makeup

- 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) | (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:** _____