Name: _____

Instructor: Dwyer

Exam II
October 26, 1999

- 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)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

Total: _____

Name: _____

Instructor: Dwyer

Multiple Choice

1.(5 pts.) If $x + \sin y = xy$ then at the point $x = 0$ and $y = 0$, the value of $\dfrac{dy}{dx}$ is

(a) 0 (b) 1 (c) -1 (d) 2 (e) $\frac{1}{2}$

2.(5 pts.) Suppose the derivative of a function $y = f(x)$ is $y' = x^2(x+2)(x-2)$. Then,

(a) $x = -2$ is a local minimum (b) $x = 2$ is a local minimum

(c) $x = 2$ is a local maximum (d) $x = 0$ is a local minimum

(e) $x = 0$ is a local maximum

Name: _____

Instructor: Dwyer

3.(5 pts.) A thin circular plate is heated in the oven. Its radius is increasing at a rate of 1 inch per hour. At what rate is the area of the plate increasing when the radius is 10 inches?

(a) 20π (b) 10π (c) 2π (d) π (e) 100π

4.(5 pts.) Let $f(x) = x^2 - 9$ for $0 \leq x \leq 5$. Then the absolute maximium occurs at $x =$

(a) -3 (b) 0 (c) 3

(d) 5 (e) there is no absolute maximum

Name: _____

Instructor: Dwyer

5.(5 pts.) The asymptotes of the function

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

are

(a) $x = -1$ and $x = -2$

(b) $x = -2$ and $y = 1$

(c) $x = 2$ and $y = -1$

(d) $x = 1$ and $x = 2$

(e) $x = -1$, $x = -2$, and $y = 1$

6.(5 pts.) Find dy for $y = \cos(4 - x^2)$

(a) $dy = y'$

(b) $dy = -\sin(4 - x^2)\ dx$

(c) $dy = 2x \sin(4 - x^2)\ dx$

(d) $dy = \dfrac{dx}{-\sin(4 - x^2)}$

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Name: _____

Instructor: Dwyer

7.(5 pts.) The first iteration of Newton's method for solving $x^3 + x^2 + 1 = 0$ starting at $x_0 = -2$ gives

(a) $x_1 = \frac{3}{8}$

(b) $x_1 = -\frac{3}{8}$

(c) $x_1 = -\frac{19}{8}$

(d) $x_1 = -\frac{15}{8}$

(e) $x_1 = -\frac{13}{8}$

Name: _____

Instructor: Dwyer

Partial Credit

8.(11 pts.) Let $y = f(x) = 5x^{2/5} - 2x$ with $y' = 2(x^{-3/5} - 1)$ and $y'' = -\frac{6}{5}x^{-8/5}$.

Find all critical points

List the intervals where f is increasing / decreasing.

List the intervals where f is concave up / concave down

List all local maxima and local minima, or say so if there are none

List all inflection points, or say so if there are none

Name: _____

Instructor: Dwyer

9.(11 pts.) Let $f(x) = \dfrac{20x}{4+x^2}$. Then, all derivatives of f are defined for all $x \in (-\infty, \infty)$. The following information is assumed to be known - we do not want you to verify it!

$$f'(x) < 0 \quad \text{for} \quad x \in (-\infty, -2) \quad \text{and} \quad x \in (2, \infty), \quad f'(x) > 0 \quad \text{for} \quad x \in (-2, 2),$$

$$f''(x) < 0 \quad \text{for} \quad x \in (-\infty, -6) \quad \text{and} \quad x \in (0, 6),$$

$$f''(x) > 0 \quad \text{for} \quad x \in (-6, 0) \quad \text{and} \quad x \in (6, \infty).$$

The only asymptote of f is $y = 0$.

Evaluate f at critical points and inflection points and graph the function.

Name: _____

Instructor: Dwyer

10.(11 pts.) Car A and car B are approaching the intersection "C" of two streets intersecting at a right angle. Car A is going South at 45 mph, car B is heading West at 30 mph. We denote the angle $\angle(C, B, A)$ by θ, the distance from C to B by x, and the distance from C to A by y. Then, $\tan\theta = \frac{y}{x}$. At what rate is the angle θ changing when car A and car B are both 1 mile from the intersection?

θ

Name: _____

Instructor: Dwyer

11.(11 pts.) Let $f(x) = 12 - x^2$ for $x \in [-\sqrt{12}, \sqrt{12}]$. The graph of f and the x-axis bound a region. Find the area of the rectangle R with largest area which can be inscribed in this region. You may use the fact that the rectangle is symmetric to the y-axis.

$-\sqrt{12}$ $\sqrt{12}$

Name: _____

Instructor: Dwyer

12.(11 pts.) About how accurately should you measure a variable t to insure that your calculation of the area of the rectangle with sides $a = t$, and $b = 2t$ is within 5% of its true value?

Name: _____

Instructor: Dwyer

13.(10 pts.) Find the value or values of c guaranteed by the Mean Value Theorem applied to the function $f(x) = x^3$ on the interval $[1, 2]$.

Name: _____

Instructor: Cholak

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Instructor: Cholak

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Name: _____

Instructor: Cholak

3.(5 pts.) A thin circular plate is heated in the oven. Its radius is increasing at a rate of 1 inch per hour. At what rate is the area of the plate increasing when the radius is 10 inches?

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(a) $x_1 = \frac{3}{8}$

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Partial Credit

8.(11 pts.) Let $y = f(x) = 5x^{2/5} - 2x$ with $y' = 2(x^{-3/5} - 1)$ and $y'' = -\frac{6}{5}x^{-8/5}$.

Find all critical points

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11.(11 pts.) Let $f(x) = 12 - x^2$ for $x \in [-\sqrt{12}, \sqrt{12}]$. The graph of f and the x-axis bound a region. Find the area of the rectangle R with largest area which can be inscribed in this region. You may use the fact that the rectangle is symmetric to the y-axis.

$-\sqrt{12}$ $\sqrt{12}$

Name: _____

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Instructor: Taylor

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Instructor: Taylor

Multiple Choice

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Partial Credit

8.(11 pts.) Let $y = f(x) = 5x^{2/5} - 2x$ with $y' = 2(x^{-3/5} - 1)$ and $y'' = -\frac{6}{5}x^{-8/5}$.

Find all critical points

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Name: _____

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Name: _____

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Name: _____

Instructor: Wong

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Total multiple choice: _____

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Name: _____

Instructor: Wong

Multiple Choice

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Instructor: Cao

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Instructor: Cao

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4.(5 pts.) Let $f(x) = x^2 - 9$ for $0 \leq x \leq 5$. Then the absolute maximium occurs at $x =$

(a) -3 (b) 0 (c) 3

(d) 5 (e) there is no absolute maximum

Name: _____

Instructor: Cao

5.(5 pts.) The asymptotes of the function

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

are

(a) $x = -1$ and $x = -2$

(b) $x = -2$ and $y = 1$

(c) $x = 2$ and $y = -1$

(d) $x = 1$ and $x = 2$

(e) $x = -1$, $x = -2$, and $y = 1$

6.(5 pts.) Find dy for $y = \cos(4 - x^2)$

(a) $dy = y'$

(b) $dy = -\sin(4 - x^2)\ dx$

(c) $dy = 2x \sin(4 - x^2)\ dx$

(d) $dy = \dfrac{dx}{-\sin(4 - x^2)}$

(e) $dy = 2\cos(4 - x^2)\sin(4 - x^2)\ dx$

Name: _____

Instructor: Cao

7.(5 pts.) The first iteration of Newton's method for solving $x^3 + x^2 + 1 = 0$ starting at $x_0 = -2$ gives

(a) $x_1 = \frac{3}{8}$

(b) $x_1 = -\frac{3}{8}$

(c) $x_1 = -\frac{19}{8}$

(d) $x_1 = -\frac{15}{8}$

(e) $x_1 = -\frac{13}{8}$

Name: _____

Instructor: Cao

Partial Credit

8.(11 pts.) Let $y = f(x) = 5x^{2/5} - 2x$ with $y' = 2(x^{-3/5} - 1)$ and $y'' = -\frac{6}{5}x^{-8/5}$.

Find all critical points

List the intervals where f is increasing / decreasing.

List the intervals where f is concave up / concave down

List all local maxima and local minima, or say so if there are none

List all inflection points, or say so if there are none

Name: _____

Instructor: Cao

9.(11 pts.) Let $f(x) = \dfrac{20x}{4+x^2}$. Then, all derivatives of f are defined for all $x \in (-\infty, \infty)$. The following information is assumed to be known - we do not want you to verify it!

$$f'(x) < 0 \quad \text{for} \quad x \in (-\infty, -2) \quad \text{and} \quad x \in (2, \infty), \quad f'(x) > 0 \quad \text{for} \quad x \in (-2, 2),$$

$$f''(x) < 0 \quad \text{for} \quad x \in (-\infty, -6) \quad \text{and} \quad x \in (0, 6),$$

$$f''(x) > 0 \quad \text{for} \quad x \in (-6, 0) \quad \text{and} \quad x \in (6, \infty).$$

The only asymptote of f is $y = 0$.

Evaluate f at critical points and inflection points and graph the function.

Name: _____

Instructor: Cao

10.(11 pts.) Car A and car B are approaching the intersection "C" of two streets intersecting at a right angle. Car A is going South at 45 mph, car B is heading West at 30 mph. We denote the angle $\angle(C, B, A)$ by θ, the distance from C to B by x, and the distance from C to A by y. Then, $\tan\theta = \frac{y}{x}$. At what rate is the angle θ changing when car A and car B are both 1 mile from the intersection?

θ

Name: _____

Instructor: Cao

11.(11 pts.) Let $f(x) = 12 - x^2$ for $x \in [-\sqrt{12}, \sqrt{12}]$. The graph of f and the x-axis bound a region. Find the area of the rectangle R with largest area which can be inscribed in this region. You may use the fact that the rectangle is symmetric to the y-axis.

$-\sqrt{12}$ $\sqrt{12}$

Name: _____

Instructor: Cao

12.(11 pts.) About how accurately should you measure a variable t to insure that your calculation of the area of the rectangle with sides $a = t$, and $b = 2t$ is within 5% of its true value?

Name: _____

Instructor: Cao

13.(10 pts.) Find the value or values of c guaranteed by the Mean Value Theorem applied to the function $f(x) = x^3$ on the interval $[1, 2]$.

Name: _____

Instructor: Jarre

Exam II
October 26, 1999

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- Be sure that your name is on every page in case pages become detached.
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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)

DO NOT WRITE IN THIS BOX!

Total multiple choice: _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

Total: _____

Name: _____

Instructor: Jarre

Multiple Choice

1.(5 pts.) If $x + \sin y = xy$ then at the point $x = 0$ and $y = 0$, the value of $\dfrac{dy}{dx}$ is

(a) 0 (b) 1 (c) -1 (d) 2 (e) $\frac{1}{2}$

2.(5 pts.) Suppose the derivative of a function $y = f(x)$ is $y' = x^2(x+2)(x-2)$. Then,

(a) $x = -2$ is a local minimum (b) $x = 2$ is a local minimum

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(e) $x = 0$ is a local maximum

Name: _____

Instructor: Jarre

3.(5 pts.) A thin circular plate is heated in the oven. Its radius is increasing at a rate of 1 inch per hour. At what rate is the area of the plate increasing when the radius is 10 inches?

(a) 20π (b) 10π (c) 2π (d) π (e) 100π

4.(5 pts.) Let $f(x) = x^2 - 9$ for $0 \leq x \leq 5$. Then the absolute maximium occurs at $x =$

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Name: _____

Instructor: Jarre

5.(5 pts.) The asymptotes of the function

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Partial Credit

8.(11 pts.) Let $y = f(x) = 5x^{2/5} - 2x$ with $y' = 2(x^{-3/5} - 1)$ and $y'' = -\frac{6}{5}x^{-8/5}$.

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$-\sqrt{12}$ $\sqrt{12}$

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Total multiple choice: _____

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Instructo: Bullwinkle

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