1. $\lim_{x\to\infty} \dfrac{\sqrt{x^4+x^2+1}+\cos(x^2+\pi)}{x^2} =$

(a) 1 (b) ∞ (c) 3 (d) 2 (e) 0

2. If the second derivative of a function f is given by

$$f''(x) = \frac{x(x-2)(x-4)(x-6)}{(x^2+1)}$$

then the number of inflection points of the graph of f is

(a) 1 (b) 4 (c) 2 (d) 5 (e) 3

3. The shortest distance from the origin to the line $2x + y = 4$ is

(a) 2 (b) $16/5$ (c) 4 (d) 1 (e) $\frac{4}{5}\sqrt{5}$

4. If $f'(x) = x^{-2}, f(1) = -1$ then $f(2) =$?

(a) -2 (b) $-1/2$ (c) 0 (d) $1/2$ (e) 2

5. If $f(x) = x^2$, $0 \le x \le 6$, find the Riemann sum with $n = 3$ taking the sample points to be Midpoints.

(a) 35 (b) 18 (c) 74 (d) 9 (e) 70

6. Evaluate the integral $\int_0^{\pi/2} (\sin x - \cos x)\, dx$. The integral is equal to

(a) 2 (b) 0 (c) -2 (d) -1 (e) 1

7. Find all functions f such that $f''(x) = \sin x + \cos x$ (A, B are constants)

(a) $-\sin x - \cos x + A + B$ (b) $\sin x - \cos x + A + B$ (c) $\sin x + \cos x + Ax + B$
(d) $-\sin x - \cos x + Ax + B$ (e) $\sin x + \cos x + A + B$

8. Find the area under the graph of the function

$$f(x) = \sqrt{x}$$

from $x = 0$ to $x = 4$.

(a) 1 (b) $\frac{16}{3}$ (c) $\frac{14}{3}$ (d) $\frac{1}{4}$ (e) $\frac{11}{2}$

9. Let $f(x) = 8x^3 - x^4$. Notice that

$$f'(x) = 4x^2(6 - x)$$
$$f''(x) = 12x(4 - x)$$

Which of the following describes the graph of $f(x)$?

(a) local minimum at $x = 0$; local maximum at $x = 6$; inflection points only at $x = 0$ and $x = 4$

(b) local maximum at $x = 6$; inflection points only at $x = 0$ and $x = 4$

(c) local minimum at $x = 0$ and $x = 6$; inflection point only at $x = 4$

(d) local minimum at $x = 0$; local maximum at $x = 6$; no inflection points

(e) local maximum at $x = 6$; inflection point only at $x = 4$ and $x = 2$

10. Find all the horizontal and vertical asymptotes of $y = \dfrac{x+1}{\sqrt{x-1}}$.

(a) $y = -1$; no vertical asymptote (b) $y = -1$; $x = -1$ (c) No horizontal asymptote; $x = 1$

(d) $y = 0$; $x = -1$ (e) $y = 1$; $x = 1$

11. Evaluate the integral $\int_{-1}^{1} (1 - |x|)\, dx$

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

12. Evaluate the integral $\int_{0}^{1} (x + 1)^3\, dx$

(a) $\frac{1}{4}$ (b) $\frac{15}{16}$ (c) $\frac{7}{3}$ (d) 7 (e) $\frac{15}{4}$

13. Let $f(x) = \dfrac{x}{x^2-1}$. Then $f'(x) = -\dfrac{x^2+1}{(x^2-1)^2}$ and $f''(x) = \dfrac{2x(x^2+3)}{(x^2-1)^3}$.

(a) Find all horizontal and vertical asymptotes.

(b) Find all critical points.

(c) Find the intervals on which the function is increasing or decreasing.

(d) Sketch the graph of f . Indicate the intervals on which the function is concave up or down.

14. Evaluate the following integrals:

(a) $\int 3x^2\sqrt{x^3+1}\,dx =$

(b) $\int \frac{\sin x}{\cos^3 x}\,dx =$

15. A box with a square base and open top must have a volume of $32,000\,\text{cm}^3$. Find the dimensions of the box that minimize the amount of material used.

16. Use Part 1 of the Fundamental Theorem of Calculus to find the derivative $g'(x)$ of the function

$$g(x) = \int_0^x \sqrt{1+2t}\, dt$$

Version 1 color:

_____

Math 119 Calculus, Exam 3

November 28, 2000

This Examination contains **16** problems, worth a total of **100** points, on **11** sheets of paper including the front cover. The first **12** problems are multiple choice with no partial credit, and each is worth **5** points. Please cross [×] the correct answers for the multiple choice questions 1–12. The last **4** problems are partial credit problems worth **10** points each. For these problems, **show** your computations and **clearly** mark your answers on the page. Books and notes are not allowed. You may use your calculator.

Name: _____

Prof: _____

1.	•	b	c	d	e	7.	a	b	c	•	e
2.	a	•	c	d	e	8.	a	•	c	d	e
3.	a	b	c	d	•	9.	a	•	c	d	e
4.	a	•	c	d	e	10.	a	b	•	d	e
5.	a	b	c	d	•	11.	a	b	c	d	•
6.	a	•	c	d	e	12.	a	b	c	d	•

Mult. Choice	_____
13	_____
14	_____
15	_____
16	_____
Total	_____

1a's 5b's 1c's 1d's 4e's

Math 119 Calculus, Exam 3

November 28, 2000

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Name: _____

Prof: _____

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
11.	a	b	c	d	e
12.	a	b	c	d	e

Mult. Choice	_____
13	_____
14	_____
15	_____
16	_____
Total	_____

Sign your name:

1. $\lim_{x\to\infty} \dfrac{\sqrt{x^4+x^2+1}+\cos(x^2+\pi)}{x^2} =$

(a) 2 (b) 3 (c) 0 (d) 1 (e) ∞

2. If the second derivative of a function f is given by

$$f''(x) = \frac{x(x-2)(x-4)(x-6)}{(x^2+1)}$$

then the number of inflection points of the graph of f is

(a) 2 (b) 5 (c) 3 (d) 1 (e) 4

3. The shortest distance from the origin to the line $2x + y = 4$ is

(a) 2 (b) $16/5$ (c) 1 (d) 4 (e) $\frac{4}{5}\sqrt{5}$

4. If $f'(x) = x^{-2}, f(1) = -1$ then $f(2) =$?

(a) $1/2$ (b) 2 (c) $-1/2$ (d) 0 (e) -2

5. If $f(x) = x^2$, $0 \le x \le 6$, find the Riemann sum with $n = 3$ taking the sample points to be Midpoints.

(a) 35 (b) 9 (c) 70 (d) 74 (e) 18

6. Evaluate the integral $\int_0^{\pi/2} (\sin x - \cos x)\, dx$. The integral is equal to

(a) 0 (b) 1 (c) -1 (d) -2 (e) 2

7. Find all functions f such that $f''(x) = \sin x + \cos x$ (A, B are constants)

(a) $\sin x + \cos x + Ax + B$ (b) $-\sin x - \cos x + A + B$ (c) $\sin x - \cos x + A + B$
(d) $-\sin x - \cos x + Ax + B$ (e) $\sin x + \cos x + A + B$

8. Find the area under the graph of the function

$$f(x) = \sqrt{x}$$

from $x = 0$ to $x = 4$.

(a) 1 (b) $\frac{14}{3}$ (c) $\frac{16}{3}$ (d) $\frac{11}{2}$ (e) $\frac{1}{4}$

9. Let $f(x) = 8x^3 - x^4$. Notice that

$$f'(x) = 4x^2(6 - x)$$
$$f''(x) = 12x(4 - x)$$

Which of the following describes the graph of $f(x)$?

(a) local maximum at $x = 6$; inflection point only at $x = 4$ and $x = 2$

(b) local minimum at $x = 0$; local maximum at $x = 6$; inflection points only at $x = 0$ and $x = 4$

(c) local minimum at $x = 0$; local maximum at $x = 6$; no inflection points

(d) local minimum at $x = 0$ and $x = 6$; inflection point only at $x = 4$

(e) local maximum at $x = 6$; inflection points only at $x = 0$ and $x = 4$

10. Find all the horizontal and vertical asymptotes of $y = \dfrac{x+1}{\sqrt{x-1}}$.

(a) $y = 0$; $x = -1$ (b) $y = 1$; $x = 1$ (c) No horizontal asymptote; $x = 1$ (d) $y = -1$; $x = -1$

(e) $y = -1$; no vertical asymptote

11. Evaluate the integral $\int_{-1}^{1} (1 - |x|)\, dx$

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

12. Evaluate the integral $\int_{0}^{1} (x + 1)^3\, dx$

(a) $\frac{7}{3}$ (b) 7 (c) $\frac{15}{4}$ (d) $\frac{1}{4}$ (e) $\frac{15}{16}$

13. Let $f(x) = \dfrac{x}{x^2-1}$. Then $f'(x) = -\dfrac{x^2+1}{(x^2-1)^2}$ and $f''(x) = \dfrac{2x(x^2+3)}{(x^2-1)^3}$.

(a) Find all horizontal and vertical asymptotes.

(b) Find all critical points.

(c) Find the intervals on which the function is increasing or decreasing.

(d) Sketch the graph of f . Indicate the intervals on which the function is concave up or down.

14. Evaluate the following integrals:

(a) $\int 3x^2\sqrt{x^3+1}\,dx =$

(b) $\int \frac{\sin x}{\cos^3 x}\,dx =$

15. A box with a square base and open top must have a volume of $32,000\,\text{cm}^3$. Find the dimensions of the box that minimize the amount of material used.

16. Use Part 1 of the Fundamental Theorem of Calculus to find the derivative $g'(x)$ of the function

$$g(x) = \int_0^x \sqrt{1+2t}\, dt$$

Version 2 color:

_____

Math 119 Calculus, Exam 3

November 28, 2000

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Name: _____

Prof: _____

1.	a	b	c	•	e
2.	a	b	c	d	•
3.	a	b	c	d	•
4.	a	b	•	d	e
5.	a	b	•	d	e
6.	•	b	c	d	e

7.	a	b	c	•	e
8.	a	b	•	d	e
9.	a	b	c	d	•
10.	a	b	•	d	e
11.	a	•	c	d	e
12.	a	b	•	d	e

Mult. Choice _____

13 _____

14 _____

15 _____

16 _____

Total _____

1a's 1b's 5c's 2d's 3e's