
Circle your section:

1000 – 1115 <i>MW</i>	100 – 215 <i>MW</i>	10 – 1115 <i>TR</i>	530 – 645 <i>TR</i>	830 – 945 <i>MW</i>
1080 – 001	1080 – 002	1080 – 003	1080 – 004	1080 – 005
Poliannikov	Kurtz	Vega	Sullivan	Douthitt

- No notes or calculator allowed, only pencil, eraser, and scrap paper
 - There is a 3 hour time limit on this exam. If the exam is not returned to the proctor in 3 hours the student will receive a zero
 - All scrap work must be collected with the exam or properly disposed of (it may not remain in the students possession)
 - Show all work and box all answers; no work shown or messy work = no credit
 - Reduce and simplify all answers to factored form with positive exponents
 - All domains, ranges, intervals, and inequalities must be answered using interval notation
 - Intercepts must be written as ordered pairs
 - Asymptotes must be written as equations of a line
 - Label at least 3 points and the function on all graphs which you sketch
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Point Totals

page 1 _____ /8	page 2 _____ /7	page 3 _____ /7
page 4 _____ /10	page 5 _____ /17	page 6 _____ /16
page 7 _____ /21	page 8 _____ /54	page 9 _____ /60

Total: _____ /200

Show All Work

In this section of the test you must show all work. Partial credit is possible in this section. Make sure all of your answers are in the correct reduced form

1. (4 pts) Using the definition of derivative (limits) find the derivative of the following function:

$$f(x) = 2x^2 + 1$$

ans: _____

2. (4 pts) Find the equation of the line tangent to the graph of $f(x) = \sqrt{4x + 9}$ at $x=0$.

ans: _____

Show All Work

3. (7 pts) Given the rational function $R(x)$ answer the following questions:

$$R(x) = \frac{x^2 - 25}{x^2 - 4}$$

(a) Find $R'(x)$ and simplify.

$R'(x)$: _____

(b) State the intervals for which $R(x)$ is increasing and decreasing.

Increasing: _____

Decreasing: _____

(c) State the local extrema of $R(x)$.

Local Max: occurs at x =_____

Local Min: occurs at x =_____

Show All Work

4. (7 pts) Given the function $f(x)$ = answer the following questions:

$$f(x) = \frac{x^4}{12} - \frac{x^3}{3} - \frac{3x^2}{2} + 5x + 1$$

(a) Find $f'(x)$ and simplify.

$f'(x)$: _____

(b) State the intervals for which $f(x)$ is concave up and concave down.

Concave Up: _____

Concave Down: _____

(c) State the inflection points of $f(x)$.

I.P's at x = _____

Show All Work

5. (5 pts) Given the following information about the polynomial function $P(x)$, $P'(x)$, and $P''(x)$, sketch a graph of $P(x)$:

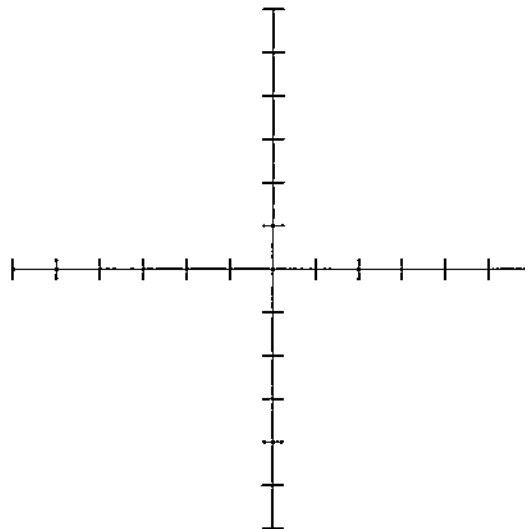
$P(x)$ has odd degree with a negative leading coefficient

$P(x)$ has x-intercepts at $(-4,0)$, $(0,0)$, and $(4,0)$

$P(x)$ has a y-intercept at $(0,0)$

$P(-2) = -3$, $P(2) = 3$

Interval	$P'(x)$	$P''(x)$
$(-\infty, -2)$	-	+
$x = -2$	0	+
$(-2, 0)$	+	+
$x = 0$	+	0
$(0, 2)$	+	-
$x = 2$	0	-
$(2, \infty)$	-	-



6. (5 pts) Given the following information about the rational function $R(x)$, $R'(x)$, and $R''(x)$, sketch a graph of $R(x)$:

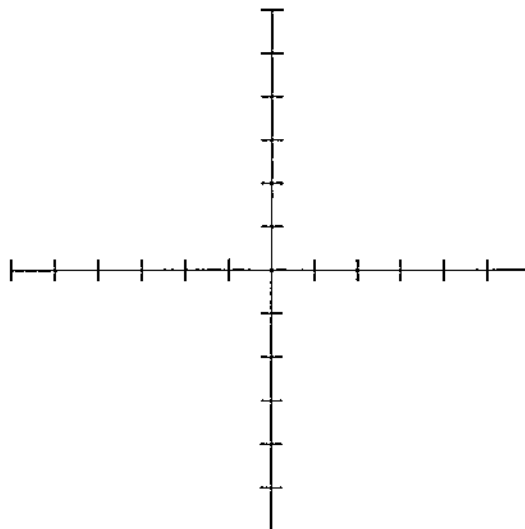
$R(x)$ has a vertical asymptote at $x = -1$, $x = 3$

$R(x)$ has a horizontal asymptote at $y = -2$

$R(x)$ has x-intercepts at $(0,0)$, $(2,0)$ and $(5,0)$

$R(x)$ has a y-intercept at $(0,0)$

Interval	$R'(x)$	$R''(x)$
$(-\infty, -1)$	-	-
$x = -1$	und.	und.
$(-1, 1)$	-	+
$x = 1$	0	+
$(1, 3)$	+	+
$x = 3$	und.	und.
$(3, \infty)$	-	+



Show All Work

7. (12 pts) Find the absolute maximum and minimum for the given function of the indicated interval.

$$f(x) = x^3 - 3x^2 - 9x + 2$$

(a) $[-2,3]$

Absolute Max: occurs at $x =$ _____

Absolute Min: occurs at $x =$ _____

(b) $(0,\infty)$

Absolute Max: occurs at $x =$ _____

Absolute Min: occurs at $x =$ _____

8. (5 pts) A fence is to be built to enclose a rectangular area. The fence along three sides is to be made of material that costs \$4 per foot while the fence along the other side is made of material that costs \$6 per foot. If the fence needs to enclose an area of 2000 square feet, find the minimum cost to build the fence.

Minimum Cost: _____

Show All Work

9. (4 pts) Use implicit differentiation to find y' for the following equation. Do not simplify your answer.

$$2xy + y^2 - e^y = y + 2x + 1$$

$y' =$ _____

10. (12 pts) Given $f(x) = 2x^2 - 3$ on the interval $[-3, 3]$ calculate the indicated sums partitioning the interval into equal lengths.

(a) L_3

ans: _____

(b) R_3

ans: _____

(c) S_3 with $c_i = \frac{x_{i-1} + x_i}{2}$

ans: _____

Show All Work

11. (16 pts) Evaluate the following integrals.

(a) $\int (x\sqrt{x-4}) dx$

(b) $\int \left(\frac{3x^2 - 1}{\sqrt[3]{(2x^3 - 2x + 3)^2}} \right) dx$

= _____

= _____

(c) $\int_0^2 \left(\frac{3x}{x^2 + 1} \right) dx$

(d) $\int_1^2 x^2(x^3 - 2)dx$

= _____

= _____

12. (5 pts) The marginal revenue from the production of x items is given by $R'(x) = 3x^2 + 2x - 5$. Find the revenue from the production of 100 units.

$R(100) =$ _____

Fill In The Blank

For this portion of the test you are not required to show any work. Put your answers in the corresponding blanks. Make sure your answers are in the correct reduced form. No partial credit will be given on this section.

13.)

(a) _____ (b) _____

(c) _____ (d) _____

(e) _____ (f) _____

(g) _____ (h) _____

14.)

(a) _____ (b) _____ (c) _____

15.)

(a) _____ (b) _____

16.)

(a) _____ (b) _____

17.)

(a) _____ (b) _____

(c) _____ (d) _____

(e) _____ (f) _____

(g) _____ (h) _____

Fill In The Blank

18.)

(a) _____

(b) _____

(c) _____

(d) _____

(e) _____

(f) _____

19.)

(a) _____

(b) _____

20.)

(a) _____

(b) _____

(c) _____

(d) _____

21.)

(a) _____

(b) _____

(c) _____

(d) _____

22.)

(a) _____

(b) _____

(c) _____

(d) _____

Fill in the blank:

Recall the following rules:

1.) $\frac{d}{dx} b^{f(x)} = b^{f(x)} \cdot \ln b \cdot f'(x)$

2.) $\frac{d}{dx} \log_b(f(x)) = \frac{1}{\ln(b)} \cdot \frac{1}{f(x)} \cdot f'(x)$

17. (24 pts) **Fill in the blank:** Evaluate the following derivatives and simplify your answers. Place your answers in the appropriate blank space on the answer sheet of the exam.

(a) $\frac{d}{dx} 7x^2 - 3x^4 - 11 =$

(b) $\frac{d}{dx} \frac{x}{\sqrt{x^3}} =$

(c) $\frac{d}{dx} (8 - 5x^3)^2 =$

(d) $\frac{d}{dx} e^{1-x} =$

(e) $\frac{d}{dx} \left(\frac{x-1}{x^2-2x+3} \right) =$

(f) $\frac{d}{dx} 2x^2 \ln(x) =$

(g) $\frac{d}{dx} \log_5(3x+2) =$

(h) $\frac{d}{dx} 3^{x^2-3x+11} =$

18. (18 pts) **Fill in the blank:** A company determined that their price-demand function was given by $p = 3x - 12$. The company has no fixed costs, and the variable costs for the company are \$21 per unit produced. Answer the following questions, place your answers in the appropriate blank space on the answer sheet of the exam.

(a) Find the profit function.

(b) Find the marginal profit function.

(c) Find the average profit function.

(d) Find the marginal average profit function.

(e) How many units should the company produce to maximize revenue?

(f) How many units should the company produce to maximize profit?

Fill in the blank:

19. (6 pts) **Fill in the blank:** Use implicit differentiation to find y' in the following problems. Place your answers in the appropriate blank space on the answer sheet of the exam.

(a) $5x^2 + 2y^2 = 9$

(b) $y - 4x + 3 = 2xy$

20. (12 pts) **Fill in the blank:** Evaluate and simplify the following indefinite integrals. Place your answers in the appropriate blank space on the answer sheet of the exam.

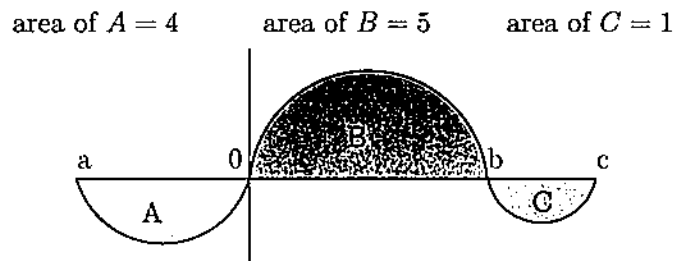
(a) $\int (3 - 11x) dx$

(b) $\int \frac{7}{3x} dx$

(c) $\int (2 - 3e^x + 5x) dx$

(d) $\int \left(1 + \frac{7}{\sqrt[3]{x^4}}\right) dx$

21. (12 pts) **Fill in the blank:** Calculate the definite integrals below by referring to the figure of $f(x)$ with the indicated areas. Place your answers in the appropriate blank space on the answer sheet of the exam.



(a) $\int_b^a f(x) dx$

(b) $\int_a^c 2f(x) dx$

(c) $\int_0^c (2f(x)) dx$

(d) $\int_c^c 3f(x) dx$

22. (12 pts) **Fill in the blank:** Evaluate and simplify the following definite integrals. Place your answers in the appropriate blank space on the answer sheet of the exam.

(a) $\int_3^{-2} 5x dx$

(b) $\int_{-1}^1 (x^2 - 6x + 9) dx$

(c) $\int_{-1}^1 (e^x + 1) dx$

(d) $\int_2^2 \left(2x^3 + \frac{5x}{\sqrt[3]{x^2}}\right) dx$