Exam 3 Version 2200 (1)

Wednesday, April 8, 2026 8:32 PM

Exam 3 Version 2...

Test Number: 2200

MA 16010 **Exam 3** **Spring 2026**

Student's Name: Solutions **Section Number:** ________________

(Without your name and section number, we will NOT be able to locate your exam booklet.)

1. Fill out your name and section number in the space provided above. On the scantron, fill in **your name, section number, test number and student ID**. Sign your name.
2. You can write on this exam booklet. Turn in both your scantron and your exam booklet when you are done. Note: **you will be graded ONLY based on your scantron answer sheet.**
3. Only a TI-30Xa calculator is allowed. No exceptions. No other electronic devices are allowed. No books or notes are allowed.
4. There are 12 questions with 8 points each for a total of 96 points. You will have 60 minutes to complete the exam. Good luck!

Instructor	Time	Section	Instructor	Time	Section
Chlopecki, Anna	2:30pm	104	Chlopecki, Anna	3:30pm	103
Cuadra, Alexandra	1:30pm	818			
Delgado, Huimei	9:30am	500	Delgado, Huimei	10:30am	100
Delworth, Tim	7:30am	200			
Makarova, Maiia	12:30pm	106	Makarova, Maiia	1:30pm	105
Singh, Mansimar	9:30am	107	Singh, Mansimar	10:30am	108
Wong Katherine	7:30am	110	Wong Katherine	8:30am	109

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Problem 1

Which of the following is/are true:

I. $\lim_{x\to\infty} \frac{-12x^8+4x^2}{6x^5+6} = -\infty$ ✓

II. $\lim_{x\to\infty} \frac{10x^3+100x+1000}{-5x^3+x^2+x+1} = -\frac{1}{2}$ X

III. $\lim_{x\to\infty} \frac{14x^6+3}{x^7+x^9} = 14$ X

1. (A) III only.
   (B) I, II and III.
   (C) I and III only.
   (D) II only.
   (E) I only.
   (F) II and III only.

Problem 2

Find the slant asymptote of $g(x) = \frac{10x^2+8x-4}{5x-1}$.

2. (A) $y = 2x + 2$
   (B) $y = 6x - 4$
   (C) $y = 10x - 4$
   (D) $y = 6x + 4$
   (E) $y = 10x + 4$
   (F) $y = 2x - 2$

$$\begin{array}{r} 2x + 2 \\ 5x-1 \overline{\big) 10x^2+8x-4} \\ -(10x^2-2x) \\ \hline 10x \end{array}$$

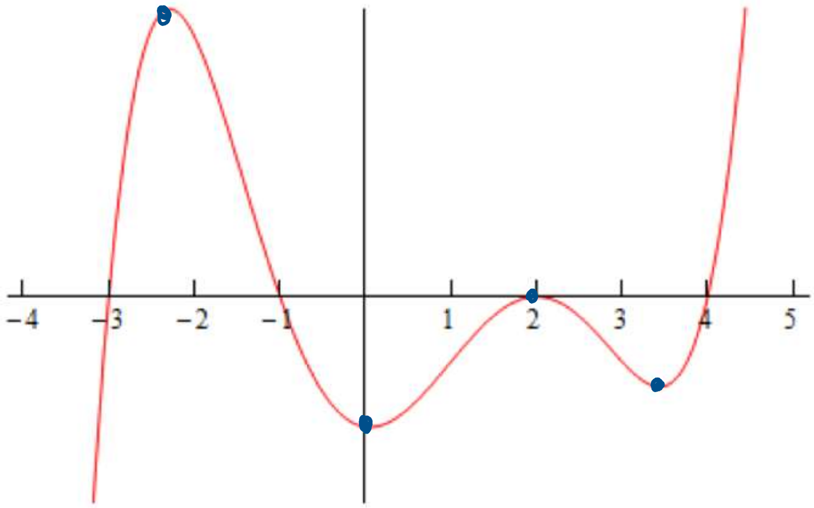
$\frac{10x^2}{5x} = 2x$

$2x(5x-1) = 10x^2 - 2x$

$\frac{10x}{5x} = 2$

Problem 3

The graph of the **derivative,** $f'(x)$, of a continuous function $f(x)$ is shown below.

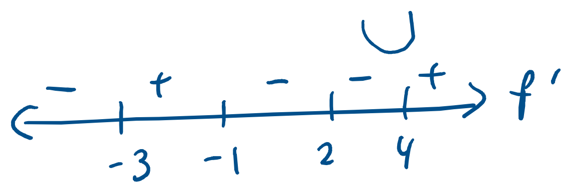


Choose the correct statement(s) about $f(x)$.

I. On the interval $(-3,-1)$, $f(x)$ is increasing. ✓

II. $f(x)$ has 4 inflection points. ✓

III. $f(x)$ has a relative maximum at $x = 4$. ✗



3. (A) II and III only

(B) I and II only

(C) I and III only

(D) I only

(E) II only

(F) III only

Problem 4

Same deg in numerator + denominator

numerator $x-3$

Which of the following functions has a horizontal asymptote of $y=2$ and an x-intercept at $x=3$?

Numerator has 2 next to leading term

4. A $f(x)=\frac{2x-6}{x+1}$ $= \frac{2(x-3)}{x+1}$

B $f(x)=\frac{2x+6}{x^2-1}$ $= \frac{2(x+3)}{x^2-1}$

C $f(x)=\frac{x^3-27}{x-1}$ $= \frac{(x-3)(x^2+3x+9)}{x-1}$

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

E $f(x)=\frac{2x^2}{x^2-9}$

F $f(x)=\frac{x^2-9}{x^2+1}$ $= \frac{(x-3)(x+3)}{x^2+1}$

Problem 5

Evaluate

$$\int(\sin x+\cos x+\csc x\cot x)dx. = -\cos x+\sin x-\csc x+C$$

5. A $-\cos x-\sin x-\sec x+C$

B $-\cos x+\sin x-\csc x+C$

C $\cos x+\sin x+\csc x+C$

D $\cos x-\sin x+\sec x+C$

E $\cos x-\sin x+\cot x+C$

F $-\cos x+\sin x-\cot x+C$

Problem 6

Use Left Riemann Sum with 4 rectangles to estimate the (signed) area under the curve of $f(x) = x^2 + 1$ on the interval of $[-1,3]$.

6. (A) 11

(B) 7

(C) 18

(D) 10

(E) 17

(F) 20

$$\Delta x = \frac{3-(-1)}{4} = \frac{4}{4} = 1$$

$$x_i = a + i\Delta x = -1 + i$$

$$f(x_i) = (i-1)^2 + 1$$

$$\sum_{i=0}^{3} f(x_i)\Delta x = (0-1)^2+1 + (1-1)^2+1 + (2-1)^2+1 + (3-1)^2+1$$

$$= 1+1+0+1+1+1+4+1$$

Problem 7

Given $y' = e^x + 2x$ and $y(0) = 4$. Find $y(1)$.

7. (A) $e+1$

(B) $e+6$

(C) $e+3$

(D) $e+5$

(E) $e+4$

(F) $e+2$

$$\frac{dy}{dx} = e^x + 2x$$

$$\int dy = \int e^x + 2x \, dx$$

$$y = e^x + \frac{2x^2}{2} + C$$

$$y = e^x + x^2 + C$$

when $y(0) = 4$

$$4 = 1 + 0 + C$$

$$3 = C$$

$$y = e^x + x^2 + 3$$

$$y(1) = e^1 + 1^2 + 3 = e + 4$$

Problem 8

Find the right Riemann sum that approximates the area under the curve of $y = \sqrt[3]{5x-1}$ on the interval [3,13] with 50 rectangles. Give the answer in sigma notation.

8. Ⓐ $\sum_{i=1}^{50} \sqrt[3]{14+i}$

Ⓑ $\sum_{i=1}^{50} \frac{1}{5}\sqrt[3]{14+i}$

Ⓒ $\sum_{i=0}^{49} \sqrt[3]{i+1}$

Ⓓ $\sum_{i=1}^{50} \sqrt[3]{i+1}$

Ⓔ $\sum_{i=0}^{49} \frac{1}{5}\sqrt[3]{14+i}$

Ⓕ $\sum_{i=1}^{50} \frac{1}{5}\sqrt[3]{i+1}$

$\Delta x = \frac{13-3}{50} = \frac{10}{50} = \frac{1}{5}$

$x_i = a + i\Delta x = 3 + \frac{i}{5}$

$f(x_i) = \sqrt[3]{5\left(3+\frac{i}{5}\right)-1} = \sqrt[3]{15+\frac{5i}{5}-1} = \sqrt[3]{i+14}$

$\sum_{i=1}^{50} f(x_i)\Delta x = \sum_{i=1}^{50} \frac{1}{5}\sqrt[3]{i+14}$

Problem 9

A particle moving on a straight line has an acceleration of

$$a(t) = 4t - 2,$$

where t is time in seconds and $a(t)$ is in ft/sec^2. If the velocity is 14 ft/sec when $t = 2$ seconds, and the position is 0 at $t = 0$, what is its position at t = 3 seconds?

$v(2) = 14$ $\quad p(0) = 0$

9. Ⓐ 39 ft

Ⓑ 57 ft

Ⓒ 45 ft

Ⓓ 27 ft

Ⓔ 36 ft

Ⓕ 51 ft

$4t - 2 = a(t) = \frac{dv}{dt}$

$\int (4t-2)\,dt = \int dv$

$\frac{4t^2}{2} - 2t + C = v$

$2t^2 - 2t + C = v$

When $v(2) = 14$

$2(2)^2 - 2(2) + C = 14$

$8 - 4 + C = 14$

$4 + C = 14$

$C = 10$

$v = 2t^2 - 2t + 10$

$\frac{dp}{dt} = v(t) = 2t^2 - 2t + 10$

$\int dp = \int 2t^2 - 2t + 10\, dt$

$p = \frac{2t^3}{3} - \frac{2t^2}{2} + 10t + C$

$p = \frac{2t^3}{3} - t^2 + 10t + C$

$0 = 0 - 0 + 0 + C$

$C = 0$

$p = \frac{2t^3}{3} - t^2 + 10t$

$p(3) = \frac{2(3)^3}{3} - 3^2 + 10(3) = 39$

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Problem 10

A company's marketing department has determined that if their product is sold at the price of p dollars per unit then they can sell $q = 2000 - 50p$ units. What is the maximum possible revenue from selling this product?

10. (A) 25,000 dollars
(B) 24,000 dollars
(C) 20,000 dollars
(D) 18,000 dollars
(E) 16,000 dollars
(F) 10,000 dollars

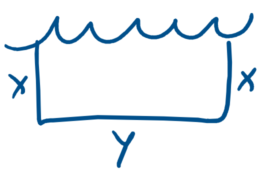
$R = p \cdot q$
$= p(2000-50p)$
$= 2000p - 50p^2$
$R' = 2000 - 100p = 0$
$20\cancel{0}\cancel{0} = 1\cancel{0}\cancel{0}p$
$20 = p$

$R(20) = 20(2000 - 50(20))$
$= 20(2000 - 1000)$
$= 20(1000)$
$= 20{,}000$

Problem 11

A rectangular field will be bordered on one side by a straight river (no fence on this side) and on the other three sides by fence. If the field must be 8000 m^2 and the fencing material costs \$17 per m of fence, what is the minimum cost of the fencing material? Round to the nearest cent.

11. (A) \$4300.70
(B) \$3710.48
(C) \$252.98
(D) \$9107.18
(E) \$535.72
(F) \$1517.88



$8000 = A = xy \iff y = 8000x^{-1}$
$P = 2x + y$
$C = \$17 \cdot P$
$= 17(2x+y)$
$= 34x + 17y$

$C = 34x + 17(8000)x^{-1}$
$C' = 34 - 17(8000)x^{-2} = 0$
$34 - \dfrac{17(8000)}{x^2} = 0$

$34 = \dfrac{17(8000)}{x^2}$
$34x^2 = 17(8000)$
$x^2 = 4000$
$x = 20\sqrt{10}$

$C = 34(20\sqrt{10}) + \dfrac{17(800\cancel{0})}{2\cancel{0}\sqrt{10}}$

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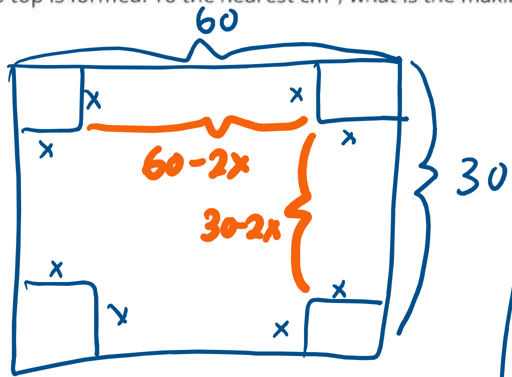
Problem 12

You start with a 60 cm by 30 cm rectangular piece of aluminum. By cutting a square from each of the corners and folding up the resulting flaps, a box with no top is formed. To the nearest cm^3, what is the maximum volume of such a box?

12.
- (A) 800
- (B) 5196
- (C) 6347
- (D) 1299
- (E) 3592
- (F) 2598



$$V = x(60-2x)(30-2x)$$

	60	$-2x$
30	1800	$-60x$
$-2x$	$-120x$	$4x^2$

$$V = x(1800 - 120x - 60x + 4x^2)$$
$$= x(1800 - 180x + 4x^2)$$
$$= 1800x - 180x^2 + 4x^3$$

$$V' = 1800 - 360x + 12x^2$$
$$= 12(150 - 30x + x^2) = 0$$
$$x = \frac{-(-30) \pm \sqrt{(-30)^2 - 4(1)(150)}}{2(1)}$$
$$= \frac{30 \pm \sqrt{900 - 600}}{2}$$
$$= \frac{30 \pm \sqrt{300}}{2} = \frac{30 \pm 10\sqrt{3}}{2}$$

$$x = \frac{30 - 10\sqrt{3}}{2}$$
$$= 15 - 5\sqrt{3}$$

$$V = x(60-2x)(30-2x)$$

$$V(15 - 5\sqrt{3}) =$$

Note:
$$x = \frac{30 + 10\sqrt{3}}{2} \approx 23.66$$
$$l = 30 - 2x = -17.$$
can't happen!