Test Number: 4400

MA 16010 **Exam 2** **Fall 2024**

Student's Name: _____ **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 one-line display scientific calculator is allowed. 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
Anderson, Sarah	3:30pm	019	Anderson, Sarah	4:30pm	020
Bairnsfather, Chris	3:30pm	002	Bairnsfather, Chris	4:30pm	001
Baring, Geoffrey	9:30am	030	Baring, Geoffrey	10:30am	029
Barnes, Russell	2:30pm	023	Barnes, Russell	4:30pm	024
Batavia, Manav	3:30pm	035	Batavia, Manav	4:30pm	036
Carper, Patrick	11:30am	033	Carper, Patrick	12:30pm	034
Chen, Ying	7:30am	300	Chen, Ying	8:30am	400
Chlopecki, Anna	3:30pm	011	Chlopecki, Anna	4:30pm	012
Dasiuk, Jaden	12:30pm	017	Dasiuk, Jaden	1:30pm	018
Delgado, Huimei	online	999			
Fong, Justin	3:30pm	008	Fong, Justin	4:30pm	007
Gismondi, Nick	1:30pm	021	Gismondi, Nick	2:30pm	022
Gutwein, Linda	10:30am	027	Gutwein, Linda	11:30am	028
Hong, Kyungtak	1:30pm	015	Hong, Kyungtak	2:30pm	016
Hsu, Alexander	3:30pm	009	Hsu, Alexander	4:30pm	010
Kessinger, Ethan	8:30am	004	Kessinger, Ethan	9:30am	003
LaClair, Adam	12:30pm	013	LaClair, Adam	1:30pm	014
O'Connor, Sam	9:30am	032	O'Connor, Sam	10:30am	031
Ouseph, Chrisil	10:30am	005	Ouseph, Chrisil	11:30am	006
Polak, Raechel	12:30pm	500	Polak, Raechel	2:30pm	200
Styles, Nikos	3:30pm	025	Styles, Nikos	4:30pm	026

Problem 1

Find the derivative of $f(x) = e^{7x}\cos(10x)$.

1. (A) $-70e^{7x}\sin(10x) - 70e^{7x}\cos(10x)$

   (B) $10e^{7x}\cos(10x) - 7e^{7x}\sin(10x)$

   (C) $7e^{7x}\cos(10x) - 10e^{7x}\sin(10x)$

   (D) $70e^{7x}\cos(10x) - 70e^{7x}\sin(10x)$

   (E) $7e^{7x}\sin(10x) - 10e^{7x}\cos(10x)$

   (F) $10e^{7x}\sin(10x) - 7e^{7x}\cos(10x)$

Problem 2

The position of a particle moving in a straight line is given by

$$s\,(t) = t^4 - 2t^3 + 3t^2 - t + 4,$$

where t is time in hours and $s\,(t)$ is in meters. What is the acceleration of the particle when $t = 2$ hours?

2. (A) 24 m/hr^2

   (B) 8 m/hr^2

   (C) 42 m/hr^2

   (D) 30 m/hr^2

   (E) 19 m/hr^2

   (F) 12 m/hr^2

Problem 3

Find $y'(1)$.

$$y = \ln \frac{x+3}{x^3+x^2+2}$$

3. (A) $-\frac{1}{2}$

   (B) -1

   (C) $\frac{3}{2}$

   (D) 0

   (E) $\frac{1}{4}$

   (F) $-\frac{9}{4}$

Problem 4

All the edges of a cube are shrinking at a rate of 4 cm/sec. How fast is the volume shrinking when each edge is 7 cm?

4. (A) 285 cm^3/sec

   (B) 588 cm^3/sec

   (C) 343 cm^3/sec

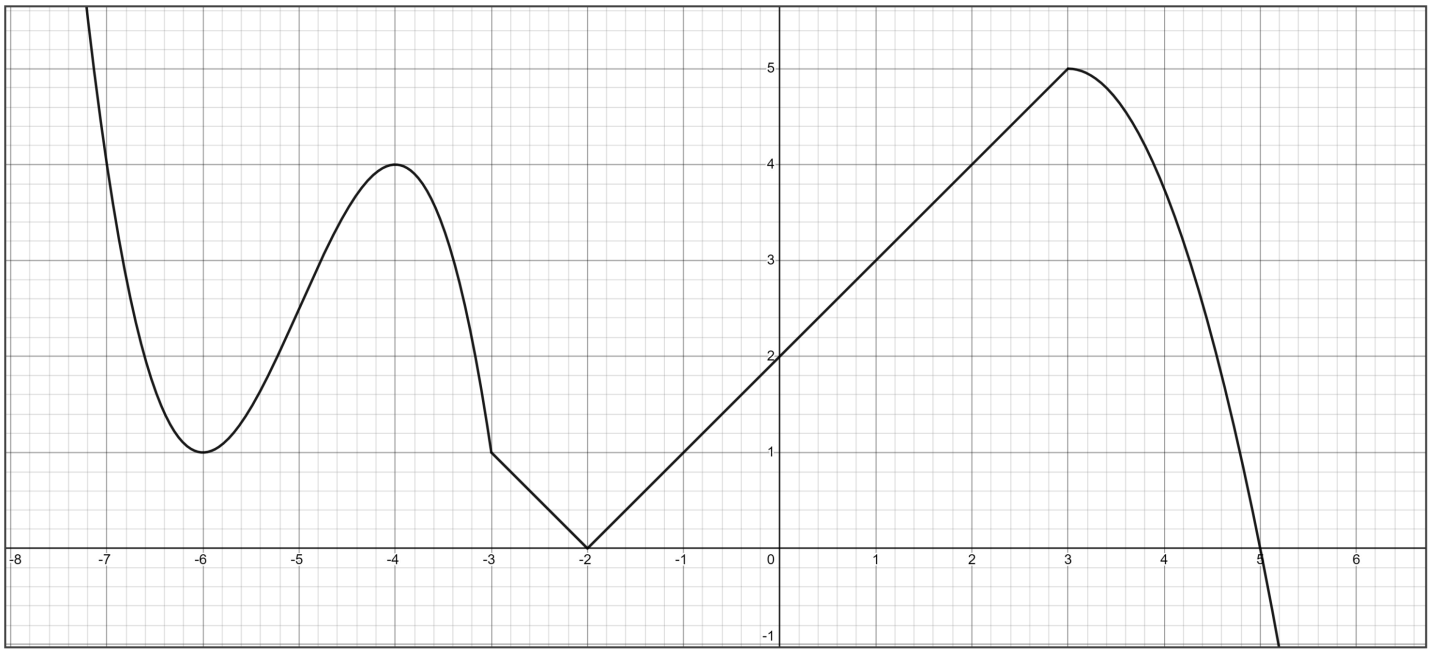
   (D) 27 cm^3/sec

   (E) 413 cm^3/sec

   (F) 147 cm^3/sec

Problem 5

Identify the relative/local maxima of the function shown in the graph below.



5. (A) $(-6,1),(-4,4),(-3,1)$

   (B) $(-4,4),(-3,1)$

   (C) $(-6,1),(-4,4),(3,5)$

   (D) $(-4,4),(-3,1),(3,5)$

   (E) $(-4,4),(3,5)$

   (F) $(-3,1),(3,5)$

Problem 6

The **derivative** of a function $f(x)$ is $f'(x) = (x-4)^2(x+3)$. Find the largest open interval(s) on which $f(x)$ is decreasing.

6. (A) $(-\infty,-3)$

   (B) $(-3,\infty)$

   (C) $(-3,4)$

   (D) $(-\infty,4)$

   (E) $(-\infty,-3)$ and $(4,\infty)$

   (F) $(4,\infty)$

Problem 7

Given $f(x) = x^3 - 3x$, find the relative extrema.

7. (A) relative maximum: $(1,0)$; relative minimum: none

   (B) relative maximum: $(1,-2)$; relative minimum: none

   (C) relative maximum: $(-1,2)$; relative minimum: $(1,-2)$

   (D) relative maximum: $(1,-2)$; relative minimum: $(-1,2)$

   (E) relative maximum: none; relative minimum: $(1,-2)$

   (F) relative maximum: none; relative minimum: $(1,0)$

Problem 8

Given $x^2 + 3xy + y^2 = 11$. Use implicit differentiation to find $\frac{\mathrm{d}y}{\mathrm{d}x}$ at $(1,2)$.

8. (A) $-\frac{8}{7}$

(B) 0

(C) $\frac{2}{3}$

(D) $\frac{3}{7}$

(E) $-\frac{7}{2}$

(F) $-\frac{8}{3}$

Problem 9

Find the x values at which the inflection points of $f(x) = \frac{1}{6}x^4 + x^3 - 10x^2 + 11$ occur.

9. (A) $x = 0$ and $x = 5$

(B) $x = -5$ and $x = -2$

(C) $x = 2$ and $x = 3$

(D) $x = -5$ and $x = 2$

(E) $x = 0$ and $x = 2$

(F) $x = 2$ and $x = 5$

Problem 10

Find the largest open interval on which the function $f(x) = 5x^3 - 15x^2 + 20$ is both increasing and concave up.

10. (A) $(1,2)$

(B) $(2,\infty)$

(C) $(-\infty,0)$

(D) $(-\infty,1)$

(E) $(1,\infty)$

(F) $(0,2)$

Problem 11

Find the absolute extrema of $y = 4x^2 + 12x - 1$ on the closed interval $[-2,0]$.

11. (A) Absolute minimum at $(-\frac{3}{2},-10)$, no absolute maximum.

(B) Absolute minimum at $(0,-1)$, absolute maximum at $(-\frac{3}{2},-10)$.

(C) Absolute minimum at $(-\frac{3}{2},-10)$, absolute maximum at $(0,-1)$.

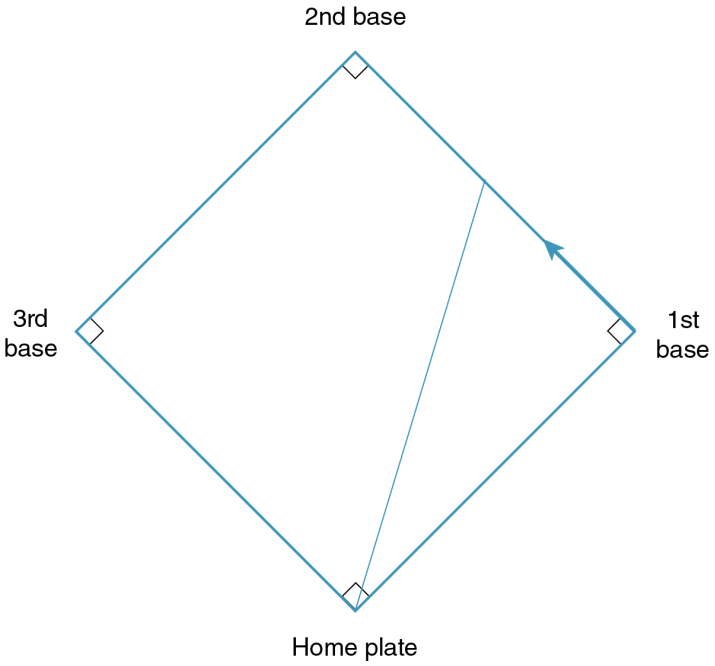
(D) Absolute minimum at $(0,-1)$, absolute maximum at $(-\frac{3}{2},-28)$.

(E) Absolute minimum at $(-\frac{3}{2},-28)$, absolute maximum at $(0,-1)$.

(F) Absolute minimum at $(-\frac{3}{2},-28)$, no absolute maximum.

Problem 12

A baseball diamond is a square with 90 ft on each side. A player runs from first base to second base at 11 ft/sec. At what rate is the player's distance from home base increasing when he is half way from first to second base?



12. (A) $\frac{11}{\sqrt{5}}$ ft/s

(B) $11\sqrt{5}$ ft/s

(C) $\frac{\sqrt{11}}{5}$ ft/s

(D) $\sqrt{55}$ ft/s

(E) 55 ft/s

(F) $5\sqrt{11}$ ft/s