UNIVERSITY AT ALBANY
STATE UNIVERSITY OF NEW YORK

AMAT100 PreCalculus Exam 2A Fall 2024

Print Name:

UAlbany Email:

Directions: You have **80 minutes** to answer the following questions. ***You must show all necessary work*** as neatly and clearly as possible. Clearly indicate your final answers by placing a box or circle around it.

No calculators, notes, textbooks, mobile phones or other aids are allowed. Do not detach pages.

Problem	Possible	Points
1	10	
2	10	
3	10	
4	10	
5	10	
6**	5	
7**	5	
Total	50	

**Optional Extra Credit Problems

(Similar concepts to HW6 Problem 6)

(1) (a) (5 Points) Find the equation of the line **parallel** to the line $2x + 6 = -7y$ and passing through the point $(-1, 2)$.

The equation of the line is $y =$ _____.

(b) (5 Points) Find the equation of the line **perpendicular** to the line $-3x + y = 12$ and passing through the point $(-6, 8)$.

The equation of the line is $y =$ _____.

(c) **(Optional: Extra Credit 2 Points)** Find the **exact** value of the average rate of change of the function $V(r) = \dfrac{4\pi r^3}{3}$ between $r = 2$ and $r = 4$.

The average rate of change is _____.

(2) (Similar concepts to Practice Problems 8) The number of tickets sold each day, $N(s)$, for an upcoming football game at UAlbany is given by

$$N(s) = -4s^2 + 88s,$$

where s is the number of days since the tickets went on sale.

(a) Find the day on which the most number of tickets was sold and how many tickets were sold on that day.

(4 Points) The day on which the most tickets were sold is _____.
(3 Points) The maximum number of tickets sold on a single day was _____.

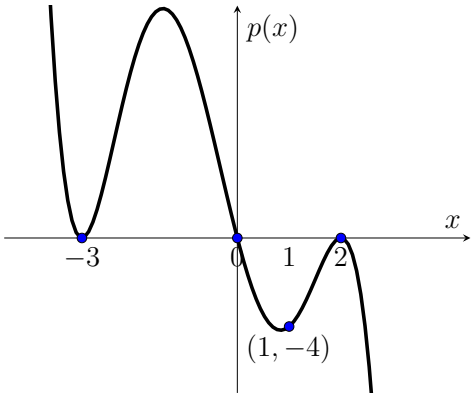
(b) (1.5 Points) Which function has the same maximum value as $N(s)$ (Circle ONE):

$$N(s-5) \quad \text{or} \quad N(s) - 5.$$

(c) (1.5 Points) Which function has the greatest number of tickets sold on a single day (Circle ONE):

$$N(s+7) \quad \text{or} \quad N(s) + 7.$$

(3) (Similar concepts to Practice Problem 9 Question 3) Find a possible formula for the polynomial graphed below.



(4) (Similar concepts to Practice Problems 10 Questions 1,2, Online Homework 8 Questions 9, 10)

The graph of $y = f(x)$ has

- Vertical asymptotes at $x = 2$ and $x = -6$.
- The x-intercept at $(-3, 0)$ and $(-5, 0)$.
- A horizontal asymptote at $y = 3$.

(a) (8 Points) Find ONE possible formula for the rational function f.

(b) (2 Points) What is the y-intercept of $y = f(x)$ found in Part (a)?

(5) (Similar concepts to Practice Problems 11 Questions 2,3,4, Online Homework 9 Questions 3,4,6)

A typical cup of coffee contains about 100 mg of caffeine and every hour 14% of the amount of caffeine in the body is metabolized and eliminated.

(a) (6 Points) Let C represent the amount of caffeine in the body (in mg) and t represent the number of hours since a cup of coffee was consumed. Write C as a function of t.

(b) (4 Points) How much caffeine is in the body after 3 hours? (You do not have to simplify)

(6) **(Optional Extra Credit Problem: 5 Points)**

Let

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

Evaluate and simplify the difference quotient:

$$\frac{f(x+h) - f(x)}{h}.$$

You may assume that $h \neq 0$. You must show all your work.

(7) **(Optional Extra Credit Problem: 5 Points)**

Find the formula for the quadratic function f that contains the following points $(2, -17), (0, 9)$ and $(-1, -13)$.