UNIVERSITY AT ALBANY
STATE UNIVERSITY OF NEW YORK

AMAT100 PreCalculus Final Exam A Fall 2024

Print Name:
UAlbany Email:

Please indicate your lecture section with a check mark (✓) in the leftmost column.

✓	Class No	Professor	Time and location
	5904	Alessandro Chilelli	MW 8:00-9:20AM ES0139
	5905	Fang Ji	WF 8:00-9:20AM ES0144
	5906	Amber Ramey	MW 11:40-1:00PM ES0140
	5907	Xun Dong	WF 11:40-1:00PM ES0139
	5908	Sam Spellman	MW 1:10-2:30PM ES0140
	5909	Jake Cordes	WF 1:10-2:30P ES0139
	5910	Jennifer Hults	MW 3:00-4:20PM ES0139
	5911	Selcuk Gurses	MW 3:00-4:20PM AS0014
	5912	Sarah Canzone	TTh 4:30-5:50PM AS0014

Directions: You have **120 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	Problem	Possible	Points
1	8		6	12	
2	10		7	12	
3	10		8	8	
4	10		9	10	
5	10				
Total (Out of 90) =					

(Similar to Exam 1)

(1) (8 Points) Let

$$f(x) = \frac{1}{x+5}$$

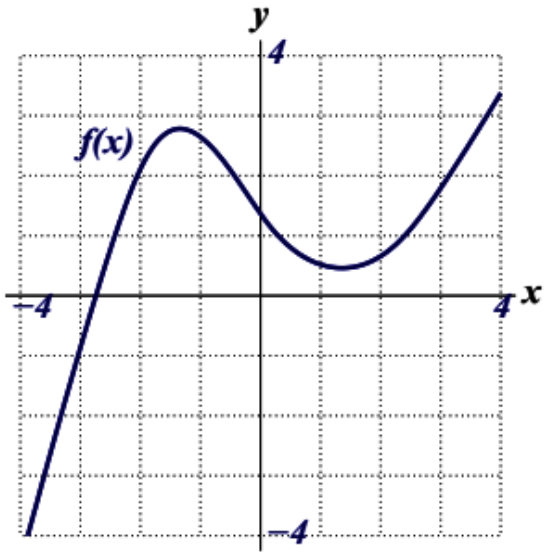
Evaluate and simplify the difference quotient:

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

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

(Similar to Practice Assessment 1)

(2) (2 Points Each) The graph of the function f, for $-4 \leq x \leq 4$, is given below.



Circle the **best** answer. You do not need to explain.

(a) $f(-3) =$

(i) -3 (ii) -1 (iii) 0 (iv) 1 (v) 3

(b) $f(f(-3)+3) =$

(i) 1 (ii) -1 (iii) $\frac{2}{3}$ (iv) $-\frac{2}{3}$ (v) 0

(c) $f(x) = 3$ if $x =$

(i) -2 (ii) -1 (iii) 1 (iv) 1.8 (v) 3.7

(d) f is decreasing and positive on the interval

(i) $(0, 2)$ (ii) $(0, 4)$ (iii) $(-\frac{4}{3}, \frac{4}{3})$ (iv) $(-4, -\frac{8}{3})$ (v) $(\frac{4}{3}, 4)$

(e) The average rate of change of f is greatest on the interval

(i) $(-1, 3.5)$ (ii) $(0, 3)$ (iii) $(-3, -1)$ (iv) $(-2, 1)$

(Similar to Practice Assessment 9 and HW8)

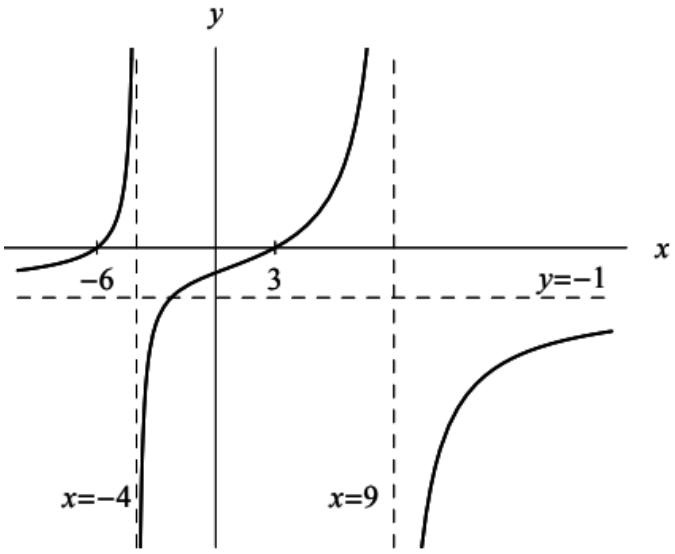
(3) (10 Points) Find ONE possible formula for a polynomial function, $y = p(x)$, with the following properties:

- $p(x)$ has exactly three zeros at $x = -2$, $x = -1$, and $x = 5$.
- $p(x)$ has a y-intercept at 25.
- As $x \to \infty$, $y \to \infty$.
- As $x \to -\infty$, $y \to \infty$.

(Similar to Practice Assessment 10 and HW8)

(4) (10 Points) Find a possible formula for the rational function graphed below. Show all you work.

Note: The y-intercept is at $(0, -1/2)$.



(Similar to Practice Assessment 11)

(5) (5 Points Each) A population of 20 turtles of an endangered species is released into a nature preserve. After 3 years the population has grown to 160 turtles.

(a) Suppose the growth is linear. Find a formula for the population after t years.

(b) Suppose the growth is exponential. Find a formula for the population after t years.

(Similar to Practice Assessment 12, HW10)

(6) (a) (6 Points) Write the expression below as a sum or difference of logarithms with no exponents or radicals. *Simplify your answer completely.*

$$\log_5\left(\frac{x^9\sqrt[4]{y^3}}{z^2}\right)$$

(b) (6 Points) Write the expression below as a **single** logarithm.

$$2\ln(x) - \ln(x+1) - \ln(x-1) + \ln(3)$$

(Similar to Practice Assessment 13, HW11)

(7) (a) (6 Points) Solve for x:

$$3^{2x-5} = 4^{3x-6}$$

(b) (6 Points) Solve for x:

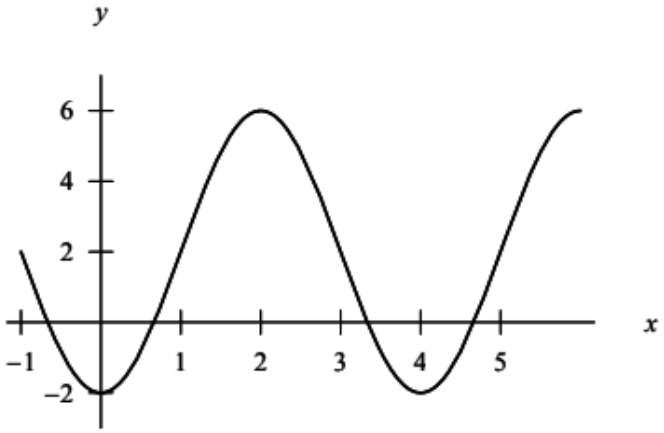
$$\log_5(x) - \log_5(x+6) = \log_5\left(\frac{1}{10}\right)$$

(Similar to HW12 Question 4 and Practice Assessment 14)

(8) (8 Points) Find a possible formula of the form

$$y = A\cos(B(x - C)) + D$$

for the sinusoidal function graphed below.



(Similar to HW13 and Practice Assessment 15)

(9) (a) (5 Points) Find the exact value of

$$\sin^{-1}\left(-\frac{1}{2}\right) + \tan^{-1}(1).$$

Express your final answer as a single fraction in radians.

(b) (5 Points) Find the exact value of

$$\tan\left(\cos^{-1}\left(\frac{1}{5}\right)\right).$$