

Math 107 Final Exam

December 21, 2022

Time: 2 hour and 25 minutes
Instructions: Show all work for full credit.
No outside materials or calculators allowed.
Extra Space: Use the backs of each sheet
for extra space. Clearly label when doing so.

Name: _____

ID #: _____

Instructor/Section: _____

*"I pledge by my honor that I have abided by the
NJIT Academic Integrity Code."*

_____ (Signature)

Problem(s) Score Total

Problem(s)	Score	Total

Formulas you may need for this exam:

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$A = P \left(1 + \frac{r}{n} \right)^{nt}$$

$$A = Pe^{rt}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

$$A + B + C = 180$$

1. A farmer wants to build a rectangular pen using a straight stone wall for one side. He has 100 ft of fence to use for the other sides. What is the maximum area that can be enclosed? What are the dimensions of the pen? **(5 points)**

2. Let $\log_a 3 = 1.2$ and $\log_a 4 = 1.5$. Evaluate each of the following:
(5 points)

x	16	16a	12	$\sqrt[3]{9}$	$3a^2$
$\log_a x$					

3. Find the exact value or state the value is undefined. Rationalize all denominators.
(4 points)

a) $\csc\left(-\frac{2\pi}{3}\right)$ _____

b) $\cos\frac{11\pi}{3}$ _____

c) $\cot\left(\frac{3\pi}{2}\right)$ _____

d) $\tan\frac{7\pi}{4}$ _____

4. Solve the following equations. **(9 points)**

a) $\frac{2-3x}{7} - \frac{x-1}{3} = \frac{3x}{7}$

5a) _____

b) $4y - 3y + 7 - y = 2 - (7 - y)$

5b) _____

c) $3 - [x + 2(3 - x)] = 2x + 1$

5c) _____

5. A) Find the equation of each line in slope-intercept form. **(6 points)**

L_1 : Parallel to $x + y = 1$ passing through $(1,1)$

5) _____

6. Expand the log expression. **(3 points)**

$$\log \frac{\sqrt{x^2+1}}{x+3}$$

6) _____

7. Condense the log expression. **(3 points)**

$$2 \ln x + \frac{1}{2} \ln(x^2 - 1) - \frac{1}{2} \ln(x^2 + 1)$$

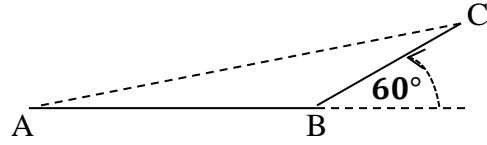
7) _____

8. **(6 points)** Divide:

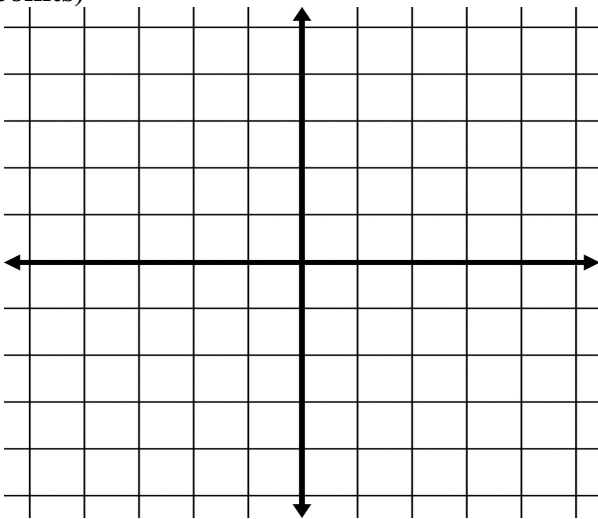
$$(x^4 + 13x^2 + x + 35) \div (x^2 - x - 6)$$

8) _____

9. To approximate the length of a marsh a surveyor walks 2 yds from point A to point B, then turns 60° and walks 4 yards to point C. Approximate (round to the nearest tenth if necessary) the length of line AC of the marsh. Refer to the figure below. **(10 points)**



10. Graph one period of the function: $y = \sin(2x) + 1$. Identify the period and the amplitude. **(4 points)**



Period: _____

Amplitude: _____

11. Solve the following systems of equations. You may use any method. **(4 points)**

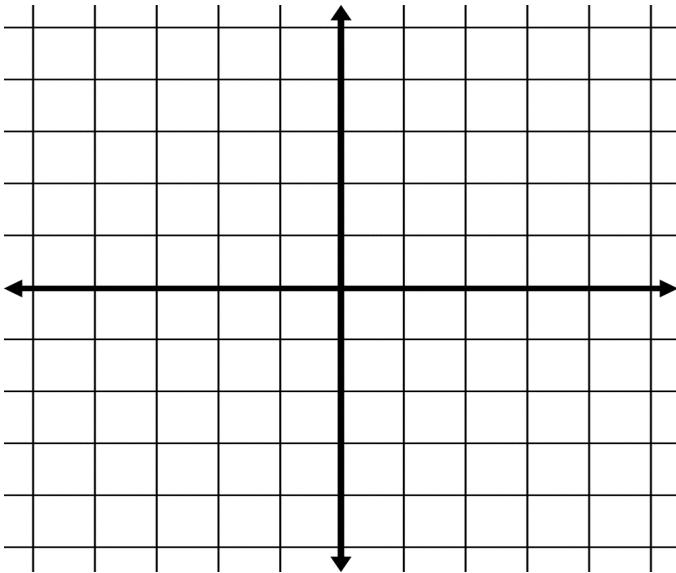
a)
$$\begin{cases} y = 2x + 1 \\ 5x + 2y = 9 \end{cases}$$

b)
$$\begin{cases} 2x - y = 5 \\ -4x + 2y = 7 \end{cases}$$

11a) _____

11b) _____

12. Sketch the graph of the function: $y = 2 \cos(x)$ Identify the period and amplitude. **(4 points)**



Period: _____

Amplitude: _____

13. (12 points) Solve the following equations

a. $2^x = 16$

a) _____

b. $2^{1-x} = 3^{4x+6}$

b) _____

c. $3 + \log(2x+5) = 2$

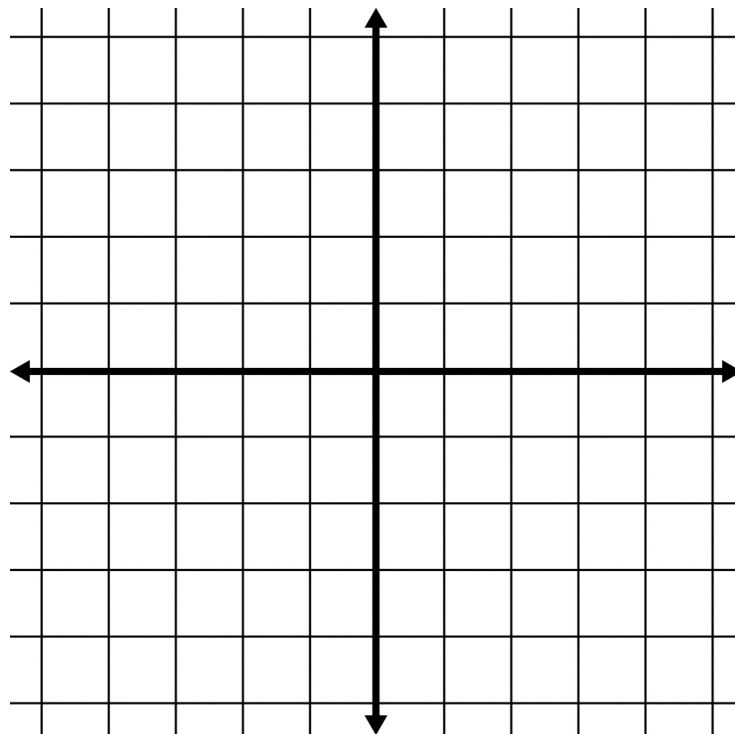
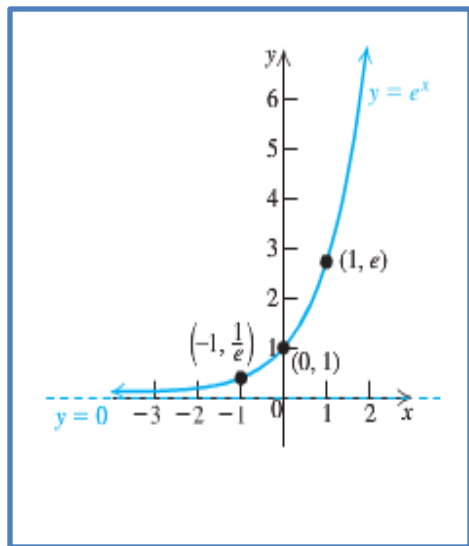
c) _____

d. $\ln(2x-3) - \ln(x+5) = 0$

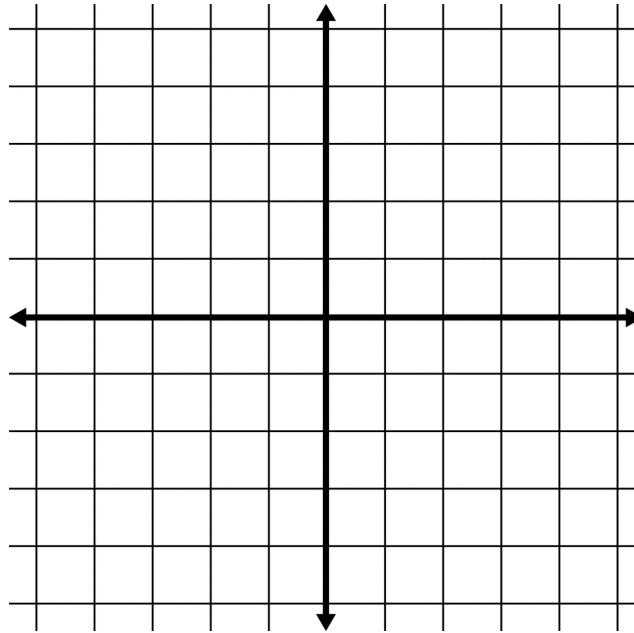
d) _____

14. Given the graph of $y = e^x$ below, use transformations to sketch the graph of: $y = e^{x+1}$

Be sure to identify the asymptote and the y – intercept. **(3 points)**



15. Use any method discussed in class to convert the quadratic equation to standard form, $y = a(x-h)^2 + k$ and sketch the graph of the quadratic function: $y = 6x - 10 - x^2$. Be sure to **identify and label the vertex, axis of symmetry and the intercepts. (6 points)**



16. Use the leading term test to determine the end behavior of: $f(x) = -2x^3 + 3x + 4$ **(4 points)**

$$x \rightarrow \infty, y = P(x) \rightarrow \underline{\hspace{2cm}}$$

$$x \rightarrow -\infty, y = P(x) \rightarrow \underline{\hspace{2cm}}$$

16) _____

17. Evaluate the given logarithmic expressions. (4 points)

a) $\log_2 16 = \underline{\hspace{2cm}}$

c) $\ln e^2 = \underline{\hspace{2cm}}$

b) $\log_4 0.25 = \underline{\hspace{2cm}}$

d) $\log_7 343 = \underline{\hspace{2cm}}$