

Math 107 Final Exam

December 19, 2018

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. Find the exact value. (8 points):

a) $\cot \frac{-11\pi}{2}$

b) $\csc \frac{2\pi}{3}$

c) $\sec \frac{7\pi}{6}$

d) $\cos \frac{5\pi}{3}$

2. Solve the following equations. (12 points)

a) $b^2 - 14b = -7b + 8$

2a) _____

b) $2x^2 + 3x = 4x + 4$

2b) _____

c) $7x^2 - 6x = 6x^2$

2c) _____

3. Let $\log_a 2 = 1.2$ and $\log_a 3 = 1.5$. Evaluate each of the following:

(5 points)

x	4	$3a$	6	$\sqrt[4]{9}$	$8a^2$
$\log_a x$					

4. Evaluate the function at the given value:
(4 points)

$$f(a) = 2a^3 - 13a^2 + 2a + 30 \text{ at } a = 6$$

5. (9 points)

a) Expand the logarithm. $\log_7(c\sqrt[6]{a})$

5a) _____

b) Condense the logarithm $\frac{\log a}{3} + \frac{\log b}{3} + \frac{\log c}{3}$

5b) _____

c) Convert to exponential form $\log_9 76 = x$

5c) _____

6. **(6 points)** Find the equation of the line that satisfies the given conditions

a. Through $(-5,3)$; Perpendicular to $y = 10x + 5$

b. Through $(2,-4)$; Parallel to the line $y = -3x + 5$

6a. _____

6b. _____

7. **(6 points)** Solve each equation

a. $81^{3-2v} = 27^{-3v}$

b. $3^{-3n-1} = 3^{2n+3}$

a. _____

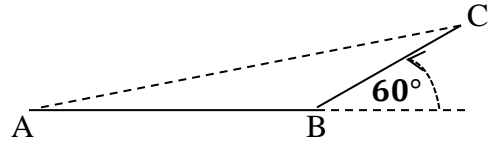
b. _____

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

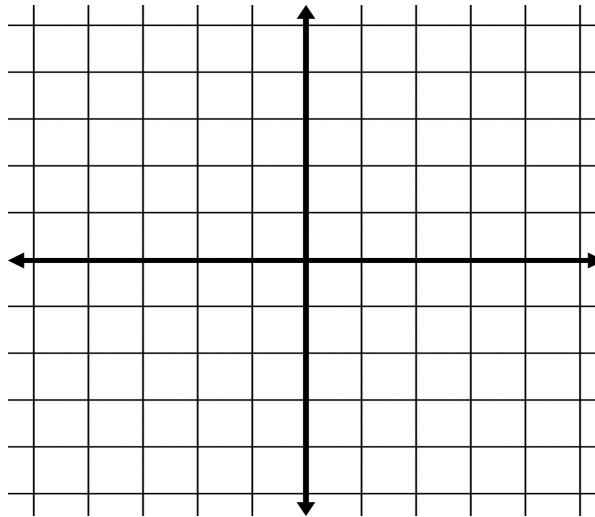
$$(n^3 + 9n^2 + 6n - 19) \div (n + 2)$$

8) _____

9. To approximate the length of a marsh a surveyor walks 11 yards from point A to point B, then turns 60° and walks 8 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: $y = 2\sin(3x)$. Identify the period and the amplitude. **(4 points)**



Period: _____

Amplitude: _____

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

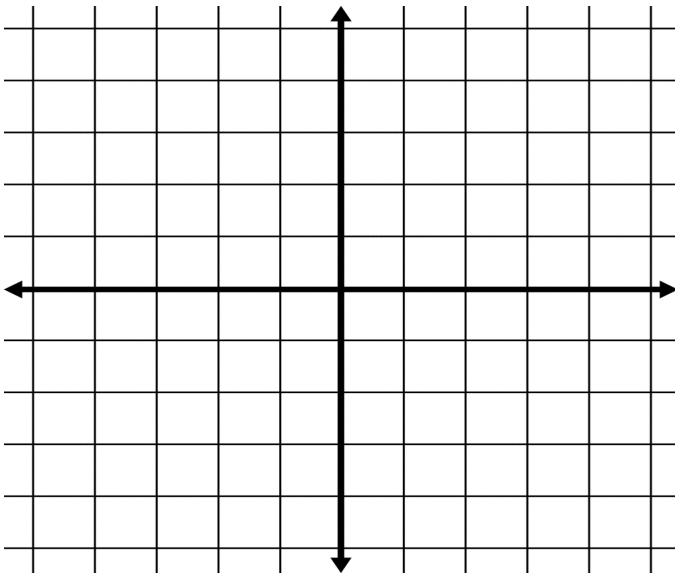
a)
$$\begin{cases} -2x + 8y = -10 \\ 9x - 2y = 11 \end{cases}$$

b)
$$\begin{cases} 3x - y = -19 \\ x + 7y = 23 \end{cases}$$

11a) _____

11b) _____

12. Sketch the graph of the function: $y = 2\cos(x) + 1$ Identify the period and amplitude. **(4 points)**



Period: _____

Amplitude: _____

13. (5 points) Perform the indicated operation.

$$h(t) = -4t - 1$$

- a. $g(t) = 3t + 1$
Find $(h + g)(t)$

a. _____

$$f(x) = 2x$$

- b. $g(x) = 2x - 4$
Find $(f \times g)(x)$

b. _____

$$h(x) = 2x - 5$$

- c. $g(x) = x^3 + 2x^2$
Find $\left(\frac{h}{g}\right)(x)$

c. _____

$$h(t) = t^2 + 3t$$

- d. $g(t) = 4t - 2$
Find $(h + g)(-8)$

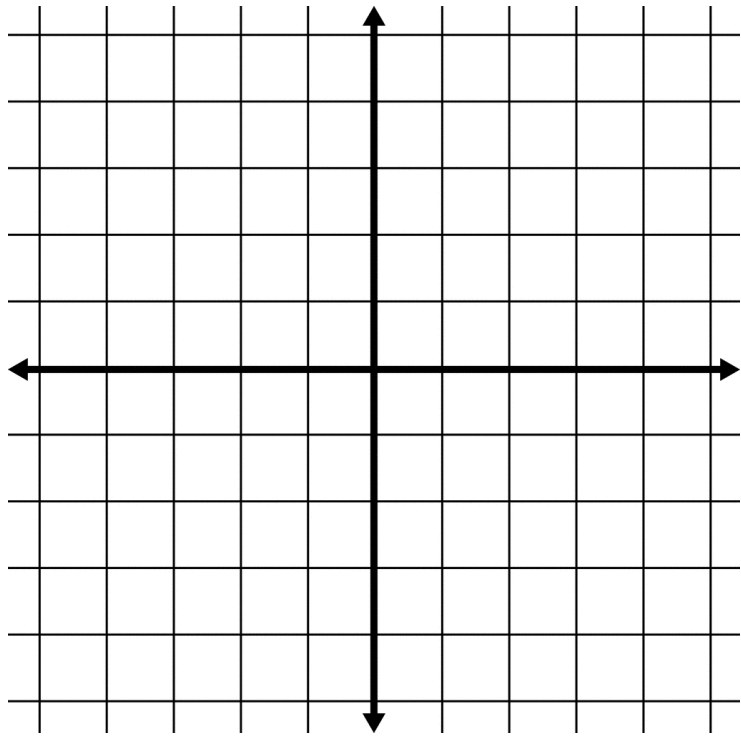
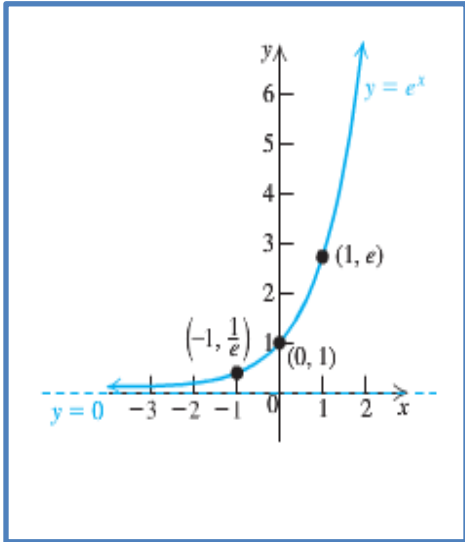
d. _____

$$g(x) = x^2 - 1$$

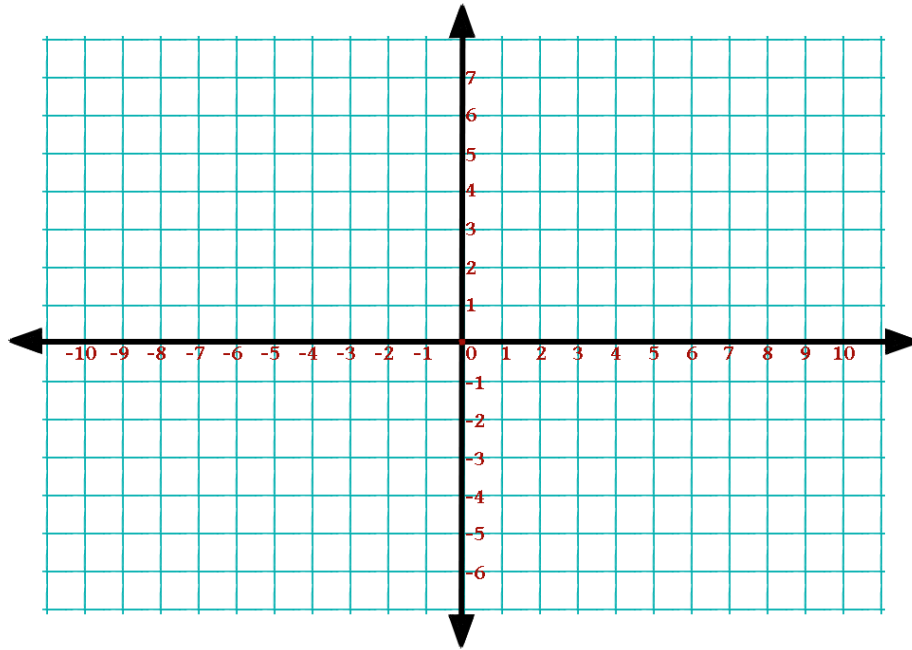
- e. $f(x) = 3x + 3$
Find $(g - f)(2)$

e. _____

14. Given the graph of $y = e^x$ below, use transformations to sketch the graph of: $y = e^{x+2} - 1$
(4 points)



15. Identify the vertex and axis of symmetry of each. Then sketch the graph. $y = x^2 - 12x + 32$
(6 points)



16. Give the degree and describe the end behavior of the graph of the polynomial function.

$f(x) = -x^3 + 14x^2 - 64x + 98$ (3 points)

$x \rightarrow \infty, y = P(x) \rightarrow$ _____

$x \rightarrow -\infty, y = P(x) \rightarrow$ _____

16. Degree _____

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

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

c) $\log_2 \frac{1}{16} = \underline{\hspace{2cm}}$

b) $\log_{49} \frac{1}{7} = \underline{\hspace{2cm}}$

d) $\log_5 \frac{1}{25} = \underline{\hspace{2cm}}$