Math 110 Common Exam III

November 30, 2016

Time: 1 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: _____

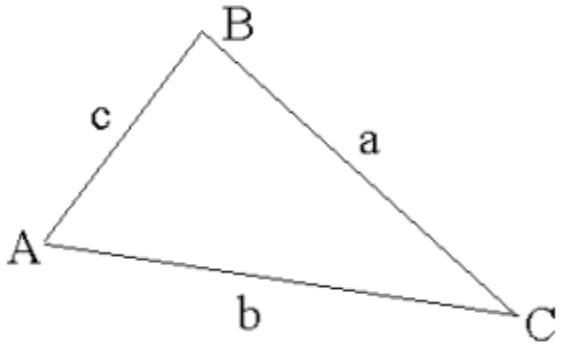
"I pledge by my honor that I will abide by the NJIT Academic Integrity Code."

_____ (Signature)

Problem(s)	Score	Total

Relevant Formulas for this Exam

Given ΔABC as shown to the right:



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

$$a^2 = b^2 + c^2 - 2bc\cos(A)$$
$$b^2 = a^2 + c^2 - 2ac\cos(B)$$
$$c^2 = b^2 + a^2 - 2ab\cos(C)$$

$$\text{Area of } \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}, \text{ where } s = \frac{a+b+c}{2}$$

Show all your work. Simplify and reduce all answers as much as possible. Rationalize all denominators.

1. a) **(5 pts)** Solve the following system of two linear equations:

$$\begin{cases} 3x + 2y = 19 \\ x - 4y = -3 \end{cases}$$

b) **(10 pts)** Solve the following system of linear equations by Substitution or Elimination. ***Note: If you are using the Substitution Method, start with the first equation and isolate for x in terms of y and z, then substitute for x in the other two equations.***

$$\begin{cases} x - y + z = 2 \\ 2x + y - 2z = -2 \\ 3x - 2y + z = 2 \end{cases}$$

2. **(10 pts)** Given the triangle ΔABC with $\angle A = 150°, b = 3$ and $c = \sqrt{3}$, solve for side 'a' and find the area of the triangle.

3. **(10 pts)** In a triangle ΔEFG, $e = 10, \angle E = 45°$ and $\angle \mathrm{F} = 60°$. Solve the triangle for $\angle$G and side ‘f’.

4. a) **(6 pts)** Solve the following trigonometric equation for all possible solutions of x in the interval $[0,2\pi)$.

$2\sin x \cos(2x) - \sin x = 0$

b) **(5 pts)** Solve the following trigonometric equation for all possible solutions of x. Express the solutions in radians.

$2\sin(x) + \cos^2(x) + \sin^2(x) = 0$

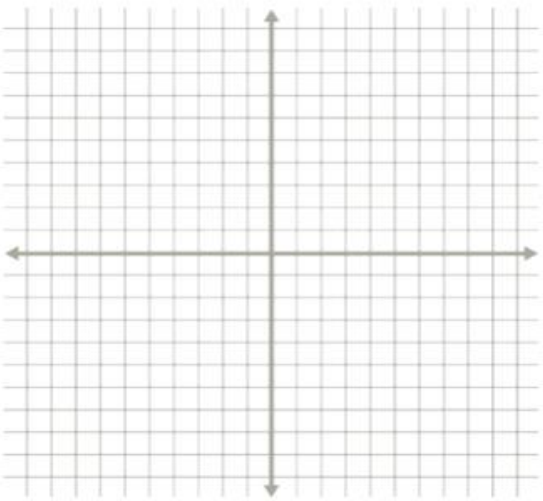
c) **(4 pts)** Solve the following equation for all possible solutions of x.

$\frac{1-x}{x} = \sqrt{5}$ (rationalize your answer)

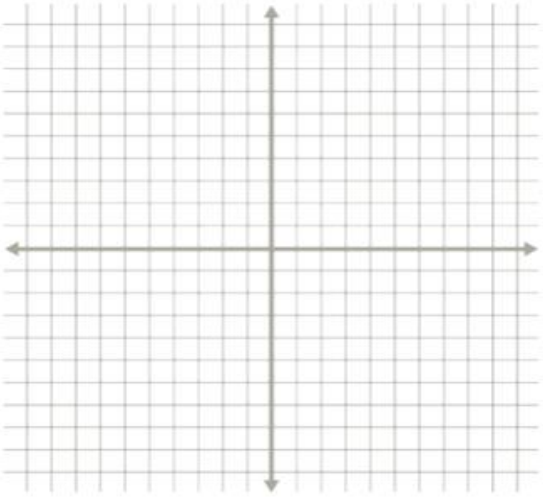
5. **(10 pts)** Suppose a triangle ΔABC has side lengths of $a = 4, b = 5$ and $c = 8$, find the area of the triangle.

6. **(15 pts)** Graph the following equation on the axis given below. Show all intercepts, center points, vertices and end points, as appropriate.

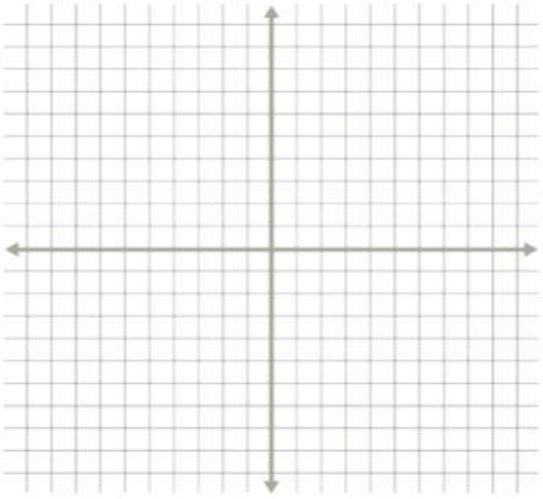
a) $(x-2)^2+(y+1)^2=25$



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



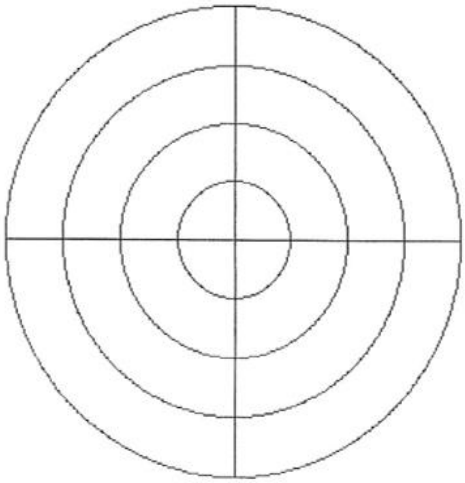
c) $\frac{(x+1)^2}{25}+\frac{(y-3)^2}{9}=1$

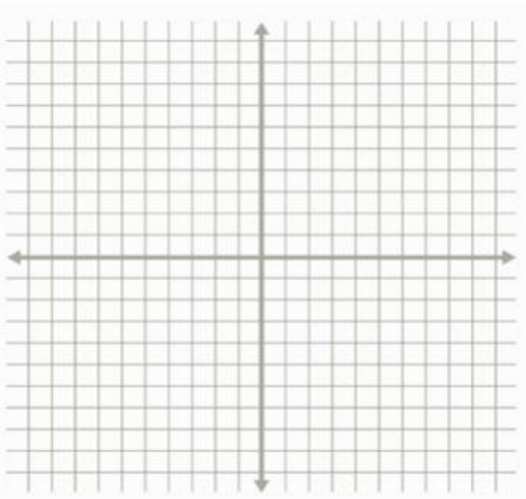


7. a) **(5 pts)** Consider the rectangular curve: $y^2 = 4x$. Convert this equation into a polar curve of the form $r = f(\theta)$. ***Note:*** $\boldsymbol{r = 0}$ ***is a trivial curve and can be discarded.*** Simplify $r = f(\theta)$ to a form that is a product of two of the six basic trigonometric functions.

b) **(5 pts)** Write the equation in standard form: $9x^2 + 4y^2 - 18x + 16y - 11 = 0$. Identify its type.

8. a) **(10 pts)** Sketch the graph of the polar curve: $r = 2 + 2\sin\theta$ on either of the axes below.





b) **(5 pts)** Find the intersection point(s) in polar coordinates (r, θ) where the curve $r = -2\sin\theta$ intersects the curve $r = 2 + 2\sin\theta$.

c) **(4 pts)** Graph the curve: $r = -2\sin\theta$ on the same set of axes as the curve above, labeling the point(s) of intersection found above in part b.