

Name: \_\_\_\_\_

Panther ID: \_\_\_\_\_

Exam 3

Trigonometry

Summer A 2016

**Important Rules:**

1. Unless otherwise mentioned, to receive full credit you **MUST SHOW ALL YOUR WORK**. Answers which are not supported by work might receive no credit.
2. Turn off your cell phone at the beginning of the exam and place it in your bag, **NOT** in your pocket.
3. **A scientific calculator is needed for some problems. If you do not have a scientific calculator, leave your answers in calculator ready form. Graphing calculators are not allowed.**
4. Notes, texts or formula sheets are prohibited. Concentrate on your own exam. Do not look at your neighbor's paper or try to communicate with your neighbor.

1. (8 pts) (a) On a rectangular coordinate system, plot the point given in polar coordinates by  $(r = -2, \theta = 5\pi/6)$ .

(b) Find other polar coordinates  $(r, \theta)$  of the point in part (a) for which  $r > 0$ ,  $0 < \theta < 2\pi$ .

(c) Find other polar coordinates  $(r, \theta)$  of the point in part (a) for which  $r > 0$ ,  $-2\pi < \theta < 0$ .

(d) Find other polar coordinates  $(r, \theta)$  of the point in part (a) for which  $r < 0$ ,  $-2\pi < \theta < 0$ .

2. (6 pts) Rectangular coordinates  $(x, y)$  are given. In each case, find polar coordinates  $(r, \theta)$  for the point.

(a)  $A(-2\sqrt{3}, 2)$

(b)  $B(-3, -3)$

**3.** (30 pts) Solve each of the following triangles. Specify if no solution, or more than one solution exist.

(a) Solve the triangle with angles  $A = 10^\circ$ ,  $C = 100^\circ$ , and side  $b = 2$ .

(b) Solve the triangle with  $a = 8$ ,  $b = 9$ , and angle  $A = 60^\circ$ .

(c) Solve the triangle with  $a = 4$ ,  $b = 4$ , and  $c = 4\sqrt{3}$ .

4. (10 pts) Two cruise-ships, the Carnivore Princess and the Royal Flounder, are leaving the port of Miami at the same initial time. The Carnivore Princess sails exactly NorthEast at a constant speed of 30 km/hour. The Royal Flounder sails exactly South at a constant speed of 25 km/hour. What is the distance between the two ships 4 hours after departure?

5. (10 pts) Sketch the graph of  $r = 1 + \sin(\theta)$ . The polar coordinates of at least five points should be given.

6. (24 pts) Solve each of the following equations on the interval  $[0, 2\pi)$ .

(a) (8 pts)  $3(1 - \sin x) = \cos^2 x$ . *Hint:* Use the appropriate identity first.

(b) (8 pts)  $\cot(3x) = \sqrt{3}$ . *Hint:* Be sure to find **all** solutions in  $[0, 2\pi)$ .

(c) (8 pts)  $\cos(2x) + 5 \cos x + 3 = 0$ . *Hint:* Use the appropriate double angle formula first.

7. (10 pts) Transform the polar equation  $r = 2\cos\theta - 6\sin\theta$  in rectangular coordinates. Then, complete the squares to show that the equation represents a circle and graph it.

8. Choose ONE. Only one will be graded. Note the different point values.

(A) (12 pts) State and prove the Law of Cosines.

(B) (8 pts) State and prove the Law of Sines.