MATH 1540 Fall 2016 Mike McCraith
Exam 3 November 10, 2016

DO NOT TURN THIS PAGE UNTIL YOU ARE INSTRUCTED TO DO SO

- Write your name below on the space provided.
- This test has a total of 5 pages.
- Work the problem in the space provided. If you need more space, write on the back of the test.
- To insure maximum credit, show your work. In general, full credit will not be given for unsupported answers.
- Look only at your test. Don't give me the impression that you are cheating.
- Draw a shark on this page for something extra.
- Be sure to write neatly. If I cannot read what was written, do not expect the problem to be graded.
- If you finish early, go over the test again.

Good luck!

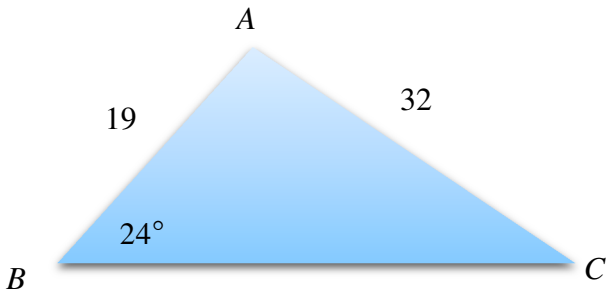
Number	Maximum	Score
1	12	
2	2	
3	5	
4	8	
5	8	
6	10	
Total	100	

Name _____

Circle Final Answers

1) (6 points each) Solve the following triangles using the appropriate Law. Be sure to show all necessary work. Round answers to nearest whole number:

a)

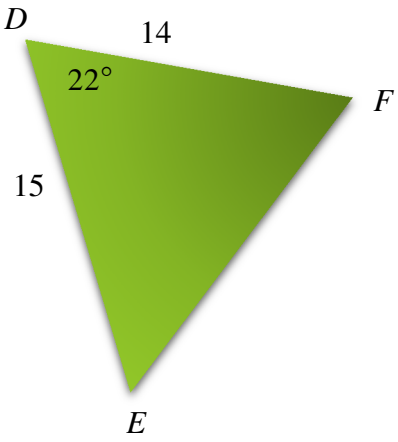


$A =$ $a =$

$B =$ $b =$

$C =$ $c =$

b)



$D =$ $d =$

$E =$ $e =$

$F =$ $f =$

2) (2 points each) Concerning the given information of a triangle, how do you know when to use the Law of Sines versus the Law of Cosines?

3) (5 points) Mike announces a test and two students begin to run away from Mike from the same point. One student runs with a bearing of $S25°W$ at 4.8 mph while the other student runs with a bearing of $N17°W$ at 5.5 mph. How far are the students from each other after 2 hours? Round answer to two decimal places. Draw a picture for this scenario.

4) (4 points each) Convert…

a) $7\left(\cos\frac{5\pi}{3}+i\sin\frac{5\pi}{3}\right)$ to standard form:

b) $-6\sqrt{3}-6i$ to trigonometric form:

5) (4 points each) For the complex numbers $z_1=\frac{7}{2}-\frac{7\sqrt{3}}{2}i$ and $z_2=-6\sqrt{3}-6i$, find the following, using the trigonometric forms and the formula $z_1\times z_2=r_1\times r_2\left[\cos\left(\theta_1+\theta_2\right)+i\sin\left(\theta_1+\theta_2\right)\right]$ for part *a* and $\frac{z_1}{z_2}=\frac{r_1}{r_2}\left[\cos\left(\theta_1-\theta_2\right)+i\sin\left(\theta_1-\theta_2\right)\right]$ for part *b*.

a) $z_1\times z_2$

b) $\frac{z_1}{z_2}$

6) (4 points part *a*; 6 points part *b*) For the complex number $-4+4\sqrt{3}i=8\left(\cos120^\circ+i\sin120^\circ\right)$, find the following. For part *a*, use the formula $\left(a+bi\right)^n=r^n\left[\cos\left(n\theta\right)+i\sin\left(n\theta\right)\right]$. For part *b*, use the formula $\left(a+bi\right)^{\frac{1}{n}}=r^{\frac{1}{n}}\left[\cos\left(\frac{\theta}{n}+\frac{360^\circ}{n}\cdot k\right)+i\sin\left(\frac{\theta}{n}+\frac{360^\circ}{n}\cdot k\right)\right]$. Write answers in standard form.

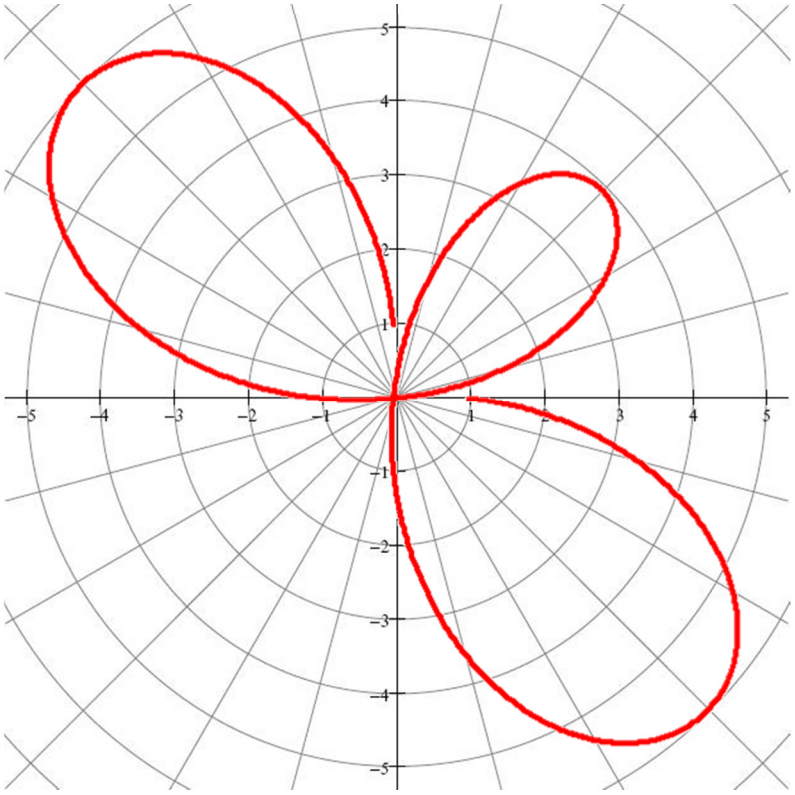
a) $\left(-4+4\sqrt{3}i\right)^2$

b) The cube roots of $-4+4\sqrt{3}i$

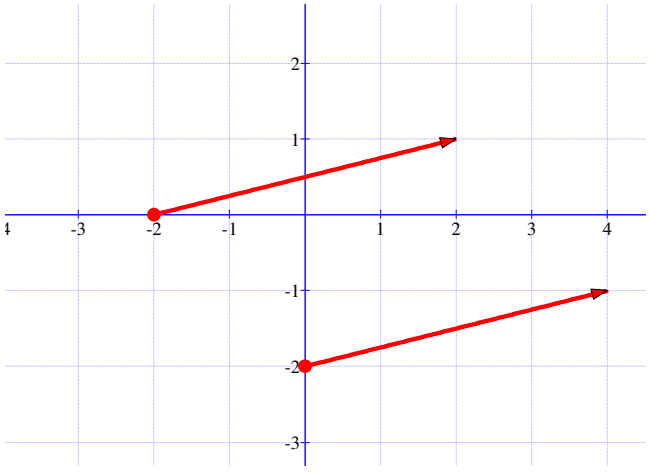
7) (4 points) Convert the rectangular point $(-5,-5)$ to the polar format (r,θ):

8) (6 points) Finish the **polar graph** of $r = 1 - 5\sin(2\theta)$ by filling in the chart and plotting points. Round answers to one decimal place:

θ	r
0°	
15°	
30°	
45°	
60°	
75°	
90°	



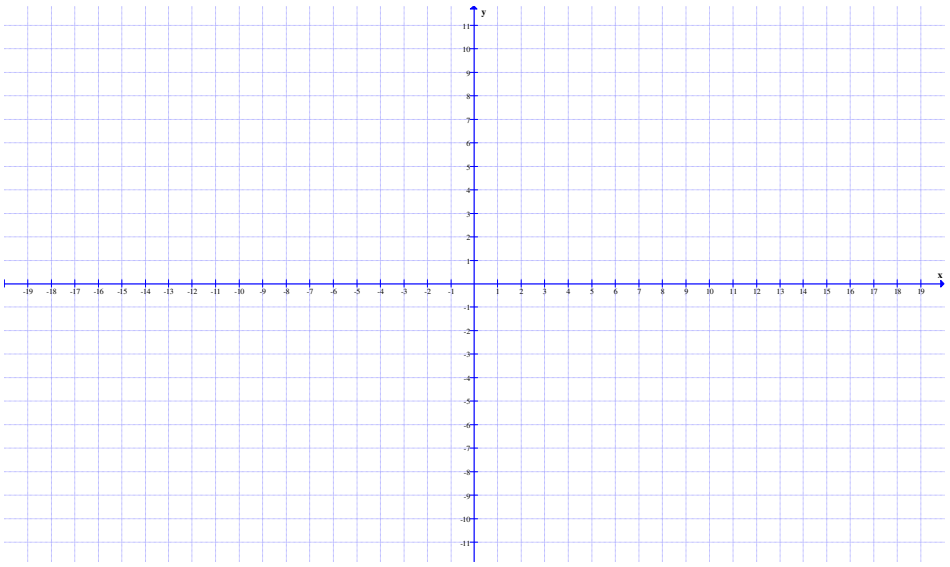
9) (4 points) For the given vectors, determine algebraically if they are equivalent by finding their magnitude and direction:



10) (10 points) Link is traveling in a boat on a bearing of $N28^\circ E$ from Nintendo Island to his new home of Sony Land. His boat travels at a rate of 20 mph. The water has a current from the west at a rate of 3 mph. After 2 hours, how far is Link from Nintendo Island? Also determine the bearing of the boat from the island.

11) (6 points) In a fit of nerd rage, two storm troopers draw an unruly George Lucas to his movie trailer when started to complain that there wasn't enough Jar Jar in the new *Star Trek* movie. The one storm trooper pulls with a force of 200 pounds and the other pulls with a force of 170 pounds. The angle between the storm troopers is 38°. Determine the combined force of the troopers in pounds.

12) (5 points) Given the vector $\vec{u} = \langle 5, 2 \rangle$ and $\vec{v} = \langle 2, 4 \rangle$, draw the vectors $\vec{u}, \vec{v}$, $\vec{u} + \vec{v}$, and $3\vec{u} - 2\vec{v}$:



13) (2 points each) Let $\vec{u} = \langle 4, -3 \rangle$ and $\vec{v} = \langle 1, 2 \rangle$. Find and simplify:

a) $4\vec{u} - 6\vec{v}$

b) $|4\vec{u} - 6\vec{v}|$

c) The unit vector in the same direction as $4\vec{u} - 6\vec{v}$:

d) $\vec{u} \bullet \vec{v}$:

e) The angle between the vectors $\vec{u}$ and $\vec{v}$. Round to two decimal places. Use the formula $\cos\theta = \dfrac{\vec{u} \cdot \vec{v}}{|\vec{u}||\vec{v}|}$

14) (10 points) An airplane travels on a bearing of $N15°W$ with an airspeed of 600 mph. A wind is blowing **from the northwest** direction at a speed of 40 mph. Find the ground speed of the plane using the formula $\vec{v} = |\vec{v}|\left(\cos\theta\vec{i} + \sin\theta\vec{j}\right)$. Round to two decimal places: