MATH 1540 Fall 2018 **Mike McCraith**
Exam 3 Part 1 **November 13, 2018**

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 3 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 turkey on this page to get something extra.**
- **Be sure to write neatly. If I cannot read what was written, do not expect the problem to be graded. A pencil must be used on all tests. Otherwise, the test will not be graded.**
- **If you finish early, go over the test again.**

Good luck!

Number	Maximum	Score
1	5	
2	6/8	
3	4	
4	2	
5	3	
6	3	
7	8	
8	10	
Total	???	

Name _____

CIRCLE FINAL ANSWERS

Round only the final answer to the nearest whole number unless otherwise noted

1) (5 points) Solve for the triangle. Be sure to show all necessary work:

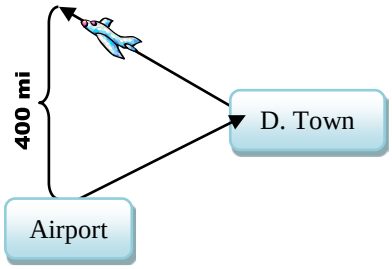
$A = 42^\circ$ $\quad a = 15$

$B = 57^\circ$ $\quad b = \_\_\_$

$C = \_\_\_$ $\quad c = \_\_\_$

2) (6 points) Math Airways drops calculators to students in need. A plane leaves the airport bearing $N27^\circ E$ towards Division Town. While flying over Division Town, the plane heads on a bearing of $N36^\circ W$. After some time, it is 400 miles due north of the airport. See picture:

a) Find the total number of miles the plane flew to and from Division Town. Round only at the end:



b) (2 points) Extra Credit: If the plane dropped one calculator every 5 feet, how many calculators were dropped on this trip?

3) (4 points) Giving away Halloween candy, Mike spots two children running blissfully through his yard. Looking at one child, who is 28 feet away, Mike turns his head 132° to see the other child, who is 35 feet away. At that exact moment, how far are the children from each other?

4) (2 points) Concerning the given information of a triangle, how do you know when to use the Law of Sines versus the Law of Cosines?

5) (3 points) Find the trigonometric form of the complex number $5+5\sqrt{3}i$:

6) (3 points) Find the standard form of the complex number $\sqrt{2}\left(\cos\frac{\pi}{4}+i\sin\frac{\pi}{4}\right)$

7) (4 points each) For the complex numbers $z_1=5+5\sqrt{3}i$ and $z_2=1+i$, 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*. Write in standard form.

a) $z_1\times z_2$

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

8) (4 points part *a*; 6 points part *b*) For the complex number $-8i=8\left(\cos 270^\circ+i\sin 270^\circ\right)$, 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) $\left(-8i\right)^4$

b) The cube roots of $-8i$:

9) (4 points each) For the point $\left(1,\frac{\pi}{4}\right)$, find a different representation of the point in polar form that satisfies the following conditions:

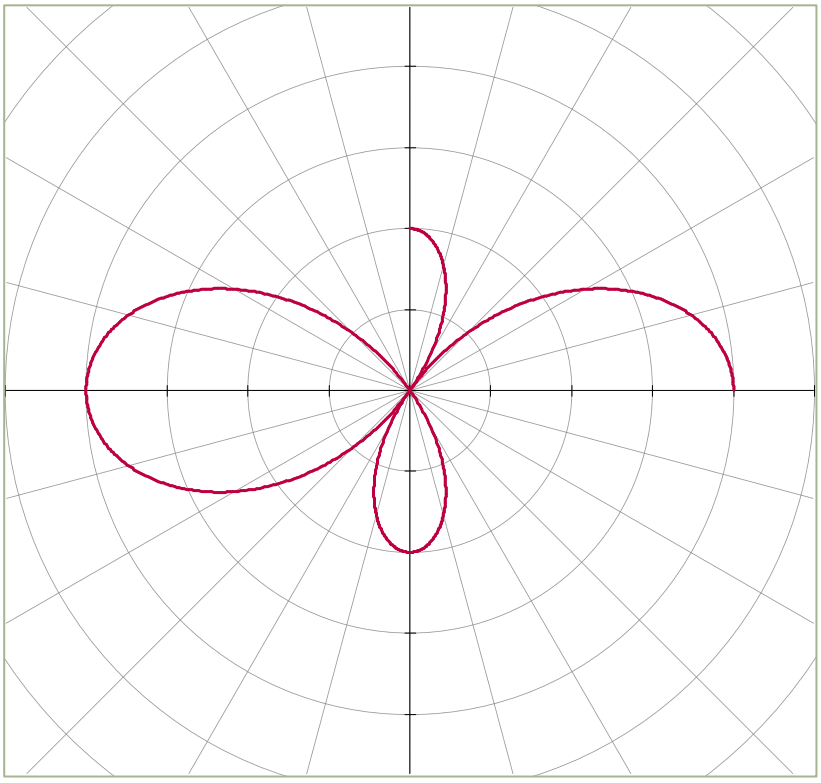
a) $r<0$ and $\theta>0$ b) $r>0$ and $\theta<0$ c) $r>0$ and $\theta>0$

10) (4 points each) Convert as stated:

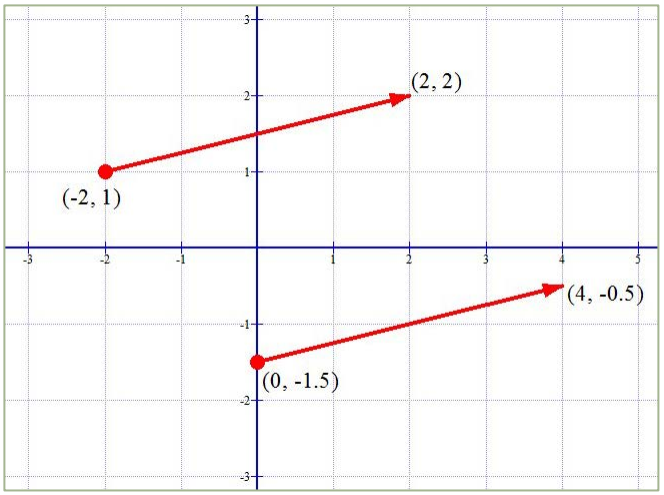
a) $\left(\sqrt{2},-\sqrt{2}\right)$ to polar: b) $\left(9,\frac{11\pi}{6}\right)$ to rectangular:

11) (4 points) Sketch a graph of $r=3\cos(2\theta)+1$. Part of the graph has been done for you. Use the values from 270° to 360° to finish the graph. Round to one decimal.

θ	r
270°	
285°	
300°	
315°	
330°	
345°	
360°	



12) (4 points) For the given vectors, determine algebraically if they are equivalent:



13) (3 points each) Let $\vec{u} = \langle 3, 2 \rangle$ and $\vec{v} = \langle 8, -3 \rangle$. Find and simplify:

a) $2\vec{u} - 4\vec{v}$

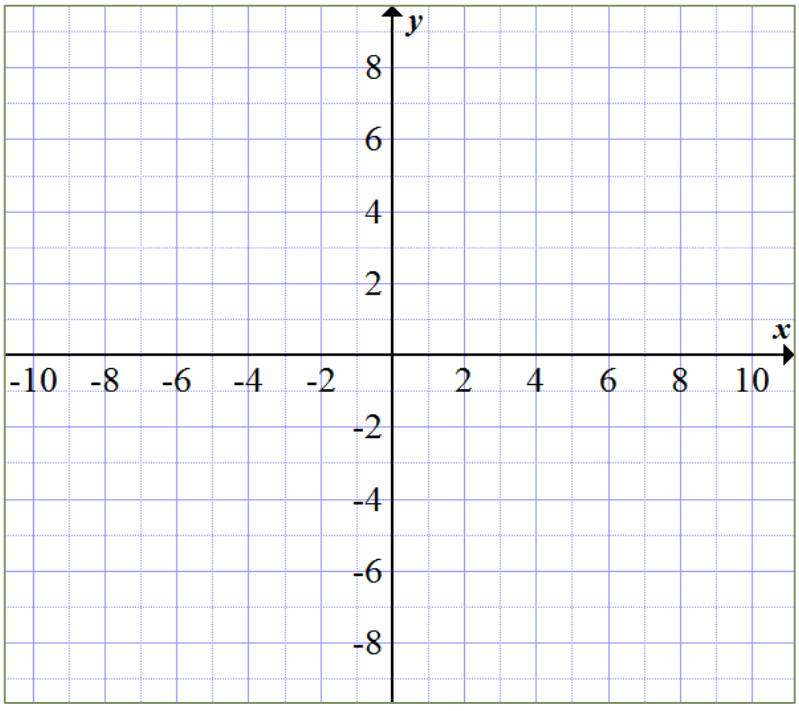
b) $|2\vec{u} - 4\vec{v}|$

c) The unit vector in the same direction as $2\vec{u} - 4\vec{v}$:

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

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) (4 points) Given the vector $\vec{u} = \langle 4, -1 \rangle$ and $\vec{v} = \langle -2, 2 \rangle$, draw and label the vectors $\vec{u}, \vec{v}$, $\vec{u} - 2\vec{v}$, and $2\vec{u} + 3\vec{v}$:



15) (8 points) An airplane travels on a bearing of $S25^{\circ}W$ with an airspeed of 630 mph. A wind is blowing from due **south** at a speed of 55 mph. Find the ground speed and bearing of the plane using the formula $\vec{v} = \left|\vec{v}\right|\left(\cos\theta\vec{i} + \sin\theta\vec{j}\right)$. Round only the final answer to two decimal places:

16) (4 points) A large, unattended child, pulls a wagon with a force of 15.5 lbs for 800 ft. The handle makes a 52° angle to the horizontal. How much work is done by the child in terms of foot-pounds? Use the formula $\cos\theta = \dfrac{\vec{u}\cdot\vec{v}}{\left|\vec{u}\right|\left|\vec{v}\right|}$. Round only the final answer to two decimal places: