

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 flower 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	6	
2	6/8	
3	4	
4	2	
5	3	
6	3	
7	4	
8	10	
Total	???	

Name _____

Circle final answers

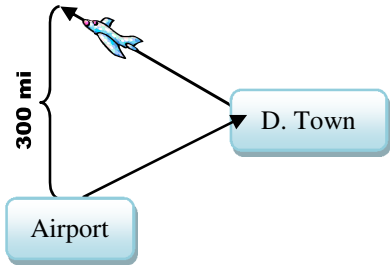
Round only the final answer to the nearest whole number unless otherwise noted

1) (6 points) Solve for the triangle. Be sure to show all necessary work:

$$\begin{array}{ll}
 A = 42^\circ & a = 15 \\
 B = 57^\circ & b = \underline{\hspace{2cm}} \\
 C = \underline{\hspace{2cm}} & c = \underline{\hspace{2cm}}
 \end{array}$$

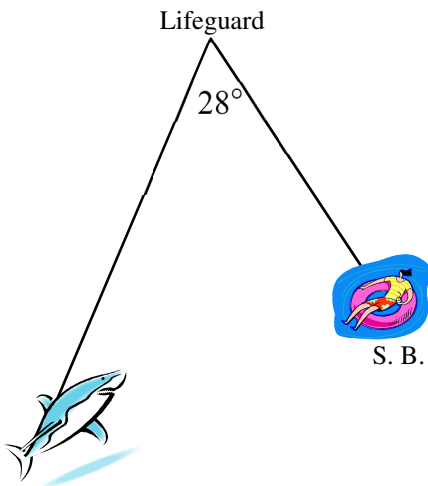
2) (6 points) Math Airways drops calculators to students in need. A plane leaves the airport bearing $N27^\circ E$ towards Division Town. While flying over Division Town, the plane heads on a bearing of $N36^\circ W$. After some time, it is 300 miles due north of the airport. See picture:

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) Silly Bill floats in the water 400 ft from a lifeguard. The lifeguard, turning 28° spots a shark 370 ft away. How far is the shark from Silly Billy?



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 $\sqrt{2}\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

7) (4 points) For the complex numbers $z_1 = \frac{\sqrt{2}}{2} + \frac{\sqrt{6}}{2}i$ and $z_2 = 5 + 5\sqrt{3}i$, find $z_1 \times z_2$, using the trigonometric forms and the formula $z_1 \times z_2 = r_1 \times r_2 [\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]$. Write final answer in standard form:

8) (4 points part *a*; 6 points part *b*) For the complex number $-2i = 2(\cos 270^\circ + i\sin 270^\circ)$, find the following. For part *a*, use the formula $(a + bi)^n = r^n [\cos(n\theta) + i\sin(n\theta)]$. For part *b*, use the formula $(a + bi)^{\frac{1}{n}} = r^{\frac{1}{n}} \left[\cos\left(\frac{\theta}{n} + \frac{360^\circ}{n} \cdot k\right) + i\sin\left(\frac{\theta}{n} + \frac{360^\circ}{n} \cdot k\right) \right]$. Write answers in standard form.

a) $(-2i)^6$

b) The cube roots of $-2i$:

8) (3 points each) For the point $\left(4, \frac{3\pi}{2}\right)$, 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 $\theta > 0$

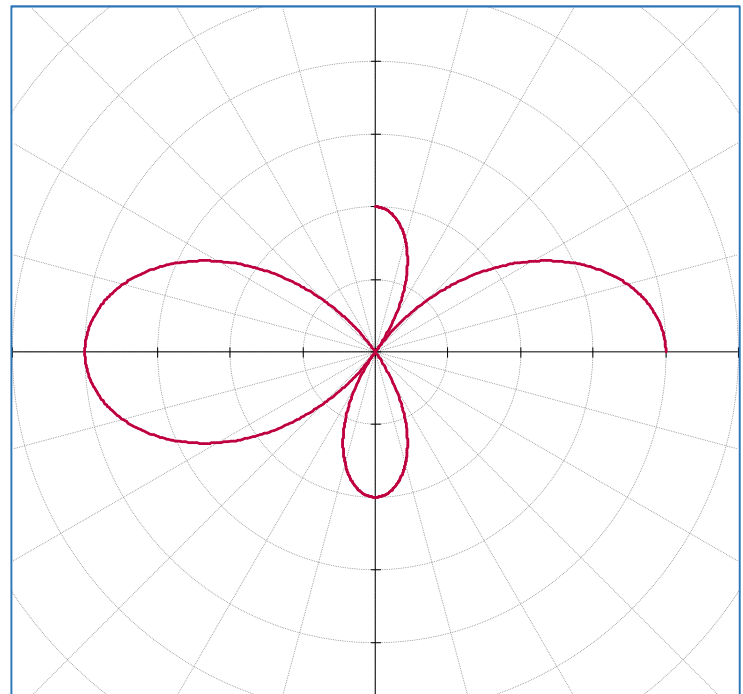
9) (4 points each) Convert as stated:

a) $(\sqrt{2}, -\sqrt{2})$ to polar:

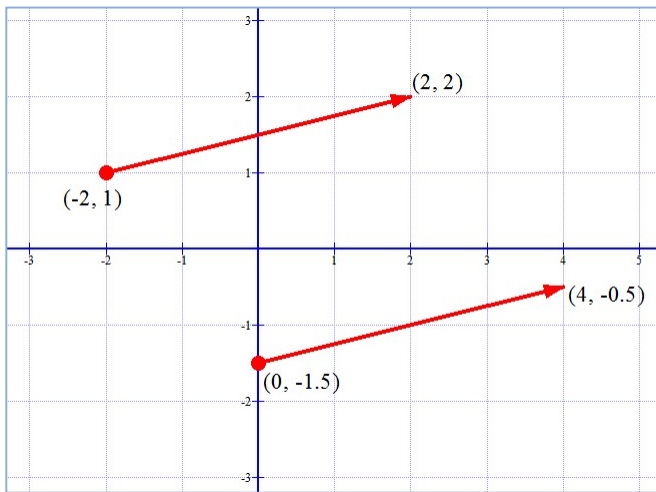
b) $(9, \frac{11\pi}{6})$ to rectangular:

10) (6 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°	



11) (5 points) For the given vectors, determine algebraically if they are equivalent:



12) (8 points) Balthier, a Dalmaskan sky pirate, flies his ship, the Strahl, from a Dalmaskan port on a bearing of $S40^\circ E$ at a speed of 525 mph. A wind is blowing from due North at a speed of 32 mph. Find the ground speed and bearing of the ship in the wind. Draw a picture and use the Law of Cosines.



Final Fantasy XII: The Zodiac Age releases in July. I preordered 5 copies. 🍀💕

13) (3 points each) Let $\vec{u} = \langle 4, 6 \rangle$ and $\vec{v} = \langle 4, 19 \rangle$. Find and simplify:

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

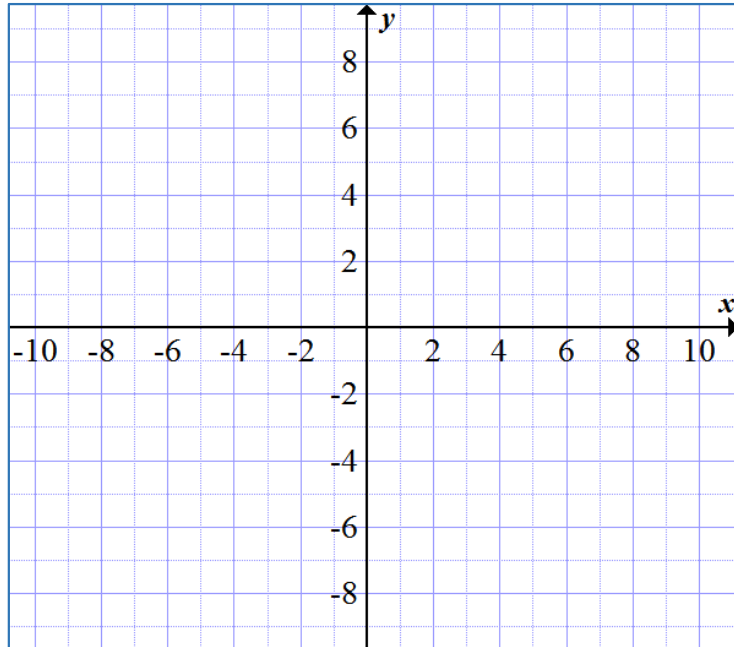
b) $|4\vec{u} - \vec{v}|$

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

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

e) The angle between the vectors \vec{u} and \vec{v} . Round to two decimal places:

- 14) (4 points) Given the vector $\vec{u} = \langle 5, 2 \rangle$ and $\vec{v} = \langle 3, -1 \rangle$, draw and label the vectors $\vec{u}, \vec{v}, \vec{u} - 3\vec{v}$, and $2\vec{u} + 2\vec{v}$:



- 15) (8 points) An airplane travels on a bearing of $S25^\circ W$ with an airspeed of 330 mph. A wind is blowing from the **south** direction at a speed of 40 mph. Find the ground speed and direction of the plane using the formula $\vec{v} = |\vec{v}|(\cos \theta \vec{i} + \sin \theta \vec{j})$. Round only the final answer to two decimal places:

- 16) (5 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?