

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 6 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!

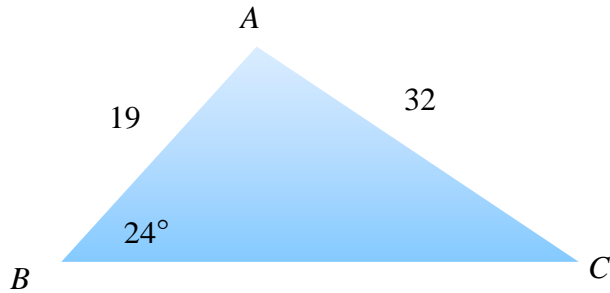
Number	Maximum	Score
1	12	
2	2	
3	5	
4	8	
5	8	
6	10	
7	4	
8	6	
9	4	
10	10	
11	6	
12	5	
13	10	
14	10	
Total	100	

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)

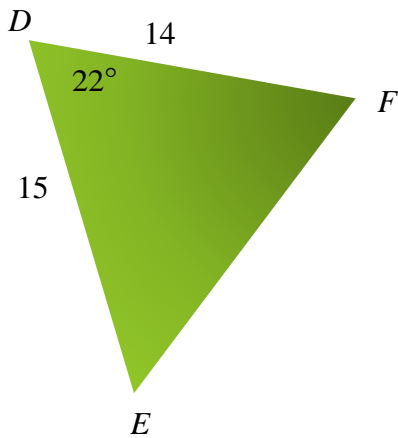


$$A = \quad a =$$

$$B = \quad b =$$

$$C = \quad c =$$

b)



$$D = \quad d =$$

$$E = \quad e =$$

$$F = \quad f =$$

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 $S25^\circ W$ at 4.8 mph while the other student runs with a bearing of $N17^\circ W$ 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 $z_1 \times z_2 = r_1 \times r_2 [\cos(\theta_1 + \theta_2) + i\sin(\theta_1 + \theta_2)]$ for part *a* and $\frac{z_1}{z_2} = \frac{r_1}{r_2} [\cos(\theta_1 - \theta_2) + i\sin(\theta_1 - \theta_2)]$ for part *b*. Write in standard form.

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 $-4 + 4\sqrt{3}i = 8(\cos 120^\circ + i\sin 120^\circ)$, 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 $(a + bi)^{\frac{1}{n}} = r^{\frac{1}{n}} [\cos(\frac{\theta}{n} + \frac{360^\circ}{n} \cdot k) + i\sin(\frac{\theta}{n} + \frac{360^\circ}{n} \cdot k)]$. Write answers in standard form.

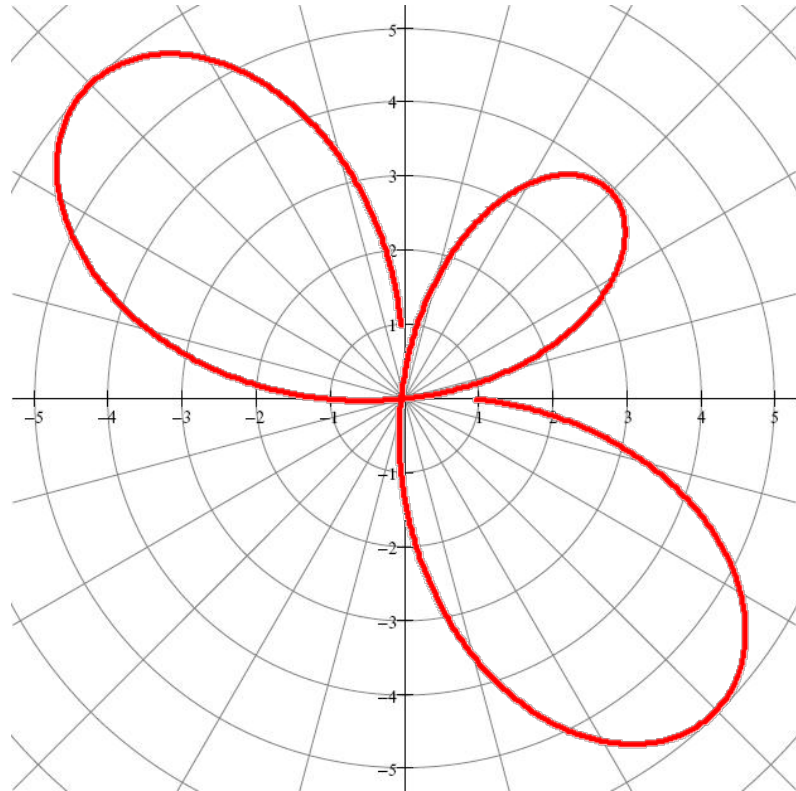
a) $(-4 + 4\sqrt{3}i)^2$

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

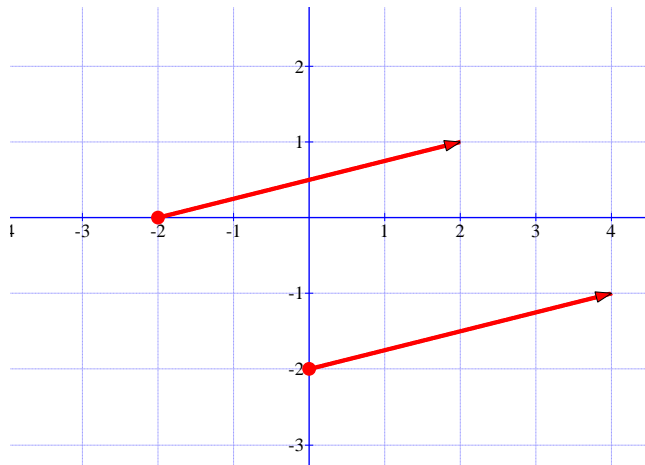
7) (4 points) Convert the rectangular point $(-5, -5)$ to the polar format (r, θ) :

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°	



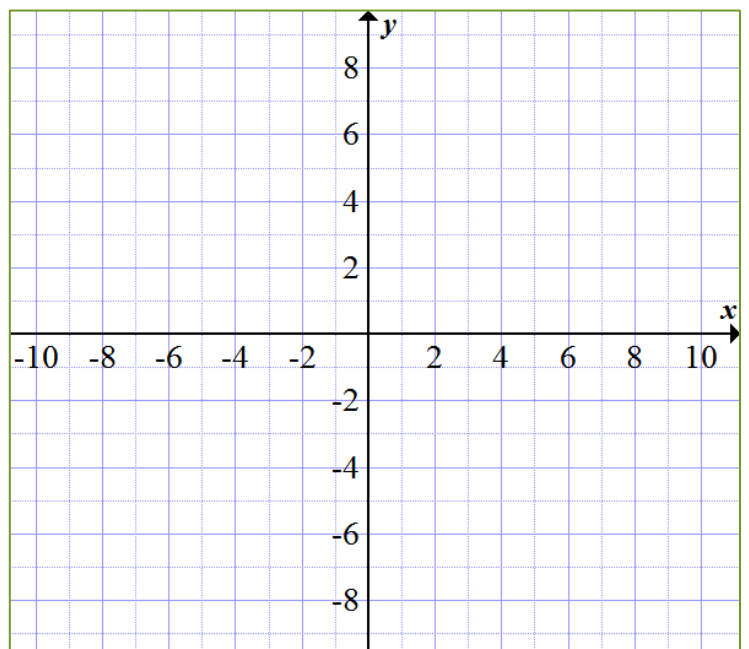
9) (4 points) For the given vectors, determine algebraically if they are equivalent:



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. Round to two places.

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. Round to two places.

12) (5 points) Given the vector $\vec{u} = \langle 5, 2 \rangle$ and $\vec{v} = \langle 3, -1 \rangle$, draw the vectors $\vec{u}, \vec{v}, \vec{u} - 3\vec{v}$, and $2\vec{u} - 3\vec{v}$:



13) (2 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) $\vec{u} \cdot \vec{v}$ using $\vec{u} \cdot \vec{v} = u_1 v_1 + u_2 v_2$:

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

$$\cos \theta = \frac{\vec{u} \cdot \vec{v}}{|\vec{u}| |\vec{v}|}$$

14) (10 points) An airplane travels on a bearing of $N15^\circ W$ 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 $\vec{v} = |\vec{v}|(\cos \theta \vec{i} + \sin \theta \vec{j})$. Round to two decimal places: