

Name \_\_\_\_\_

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Score (100 possible) \_\_\_\_\_

Exam 4

Answer each question to the best of your ability. Show all of your work. You may use a calculator to perform calculations, but in order to receive credit, *all relevant work must be shown!*

1. Solve each of the following triangles. If the given information is ambiguous, solve for all possibilities.

a.  $a = 2$ ;  $b = 1$ ;  $\alpha = 120^\circ$  (8 points)

b.  $a = 5$ ;  $b = 6$ ;  $c = 8$  (8 points)

c.  $a = 4$ ;  $b = 5$ ;  $\beta = 60^\circ$  (8 points)

d.  $\alpha = 50^\circ$ ;  $\beta = 30^\circ$ ;  $a = 1$  (6 points)

2. A radio transmission tower is 200 feet high. How long should a guy wire be if it is to be attached to the tower 10 feet from the top and is to make an angle of  $21^\circ$  with the ground? (5 points)

3. Convert the point  $(-2, 210^\circ)$  to rectangular coordinates (exactly, not a decimal approximation). (3 points)

4. Convert the point  $(-3, 0)$  to polar coordinates. (3 points)

5. Write each complex product in standard form  $a + bi$ .

a.  $(\cos 25^\circ + i \sin 25^\circ) \cdot 5(\cos 65^\circ + i \sin 65^\circ)$  (4 points)

b.  $\left(\frac{3}{5} - \frac{4}{5}i\right)^{10}$  (5 points)

6. Let  $\mathbf{v} = 5\mathbf{i} + 2\mathbf{j}$  and  $\mathbf{w} = \mathbf{i} - \mathbf{j}$ . Find each of the following:

a.  $\mathbf{v} + \mathbf{w}$  (2 points)

b.  $4\mathbf{v} - 3\mathbf{w}$  (2 points)

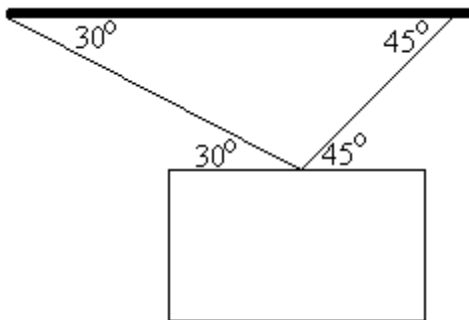
c.  $\|\mathbf{v}\|$  (3 points)

d.  $\mathbf{v} \cdot \mathbf{w}$  (3 points)

e. The angle between  $\mathbf{v}$  and  $\mathbf{w}$ . (5 points)

f. A unit vector in the direction of  $\mathbf{w}$ . (5 points)

7. A weight of 1500 pounds is suspended from two cables as shown in the figure. What are the tensions in each cable? (10 points)



8. An object attached to a coiled spring is allowed to oscillate. Assuming that the motion is simple harmonic with period 7 seconds, and that the object is at most a distance of 3 units from its equilibrium position, write an equation that relates the displacement  $d$  of the object from its rest position after  $t$  seconds. (5 points)

9. In chapter 7 we discussed three different types of equations for finding the area of a triangle:

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}ab \sin \gamma$$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad s = (a+b+c)$$

Give a real world example of when each formula may be preferred. (here you need three separate examples) Draw pictures to illustrate your point. (5 points each)