

Math 113 - Spring 2002 - Exam II

Name: _____

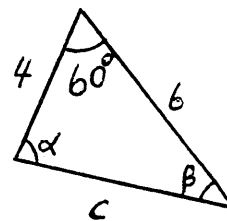
Signature: _____

Instructor: _____

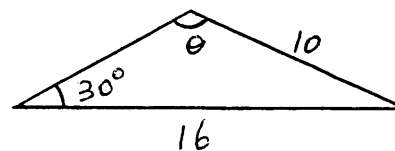
- (a) To receive credit for an answer, you must justify that answer. **No work no credit.**
- (b) Whenever possible, give **EXACT** values.

Problem	Points	Scores
1	15	
2	25	
3	25	
4	30	
5	15	
6	30	
Total	140	

1. Find the values of α , β , and c in the triangle shown below. Give your answers accurate to two decimal places. (15 pts)



In the triangle below, the angle θ is obtuse.
(a) Find the **EXACT** value of $\sin \theta$. (6 pts)



(b) With your calculator in **DEGREE** mode, find $\sin^{-1}(\sin \theta)$: (3 pts)

Do not use calculator for the rest of this problem

(c) Explain why $\sin^{-1}(\sin \theta)$ is acute while the pictured θ is obtuse. (8 pts)

(d) Find the value of $\sin^{-1}(\sin \theta)$, using answer to (b). Explain briefly what you did and why it is correct. (8 pts)

Suppose an airplane

- is to travel to a destination at 35° (east of north) from its departure point
- will encounter a wind blowing directly from west to east at 100 knots
- will travel at an air speed of 500 knots (i.e. the speed through the air)

(a) With care, sketch a figure showing all above quantities.

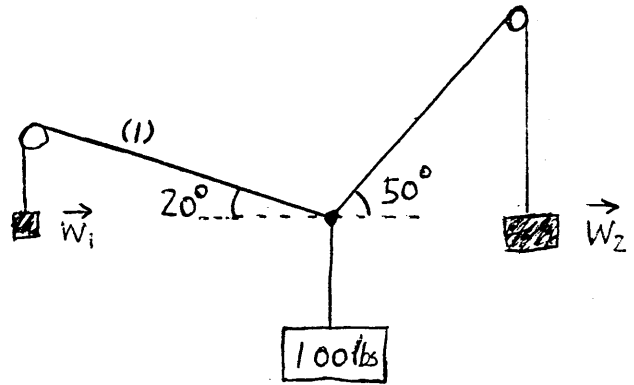
(5 pts)

(b) Find the correct heading for the plane (i.e. the direction to which the plane heads). (10 pts)

(c) Find the ground speed of the plane (i.e. the speed of the airplane over the ground). (10 pts)

The weight and pulley system indicated below is in static equilibrium.

- (a) Express the force acting along the line (1) in terms of the unit vectors \vec{i} and \vec{j} . (10 pts)



- (b) Find the weights \vec{W}_1 and \vec{W}_2 . (20 pts)

5. Check if each formula is an identity. If it is an identity, prove it. If it is not, explain how you know that is not an identity.

(a) $\cos(2x) = 1 - 2\cos^2 x$.

(5 pts)

(b) $\sin^2\left(\frac{x}{2}\right) = 1 - \cos x$.

(5 pts)

(c) $\sin(\pi - 2x) = \sin(2x)$.

(5 pts)

6. (a) Find the **EXACT** value of $\cos 75^\circ$.

(10 pts)

(b) Find the **EXACT** value of $\sin(\cos^{-1}(\frac{1}{5}) + \sin^{-1}(-\frac{2}{3}))$.

(10 pts)

(c) Find the **EXACT** value of $\sin(\tan^{-1}(-2))$.

(10 pts)