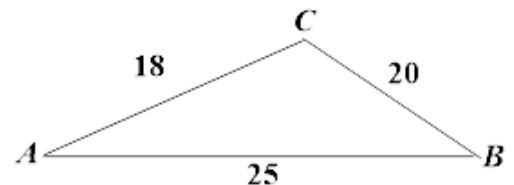


- 3.1 – Law of Sines  
3.3 – Law of Cosines  
3.4 – Vectors in the Plane

1. For each of the following, state whether there is no solution, one solution or there are two solutions. Then explain why, using one or two pictures, and some comparisons. Finally, solve the triangle using the Law of Sines. In the case of two solutions,  $B_1$  and  $B_2$ , you will find  $B_1$ , using the Law of Sines, and then  $B_2 = 180^\circ - B_1$ , etc.

- (5 pts) The measure of angle  $A$  is  $30^\circ$ . The length of side  $b$  is 20 and the length of side  $a$  is 25.
- (5 pts) The measure of angle  $A$  is  $30^\circ$ . The length of side  $b$  is 20 and the length of side  $a$  is 9.
- (5 pts) The measure of angle  $A$  is  $30^\circ$ . The length of side  $b$  is 20 and the length of side  $a$  is 15.
- (Bonus 5 pts)** Suppose  $\sin(B_1) = 2/3$ . Show why  $B_2 = 180^\circ - B_1$ , using a graph of sine to make your point.
- (Bonus 5 pts)** Draw 2 triangles in the plane in standard position satisfying  $\sin \theta = \frac{2}{3}$ . Show that if  $\theta_1$  is a solution of the equation in Quadrant I, then the 2<sup>nd</sup> solution is  $180^\circ - \theta_1$ . Include the phrase "reference angle" in your discussion.

2. (5 pts) Solve the triangle given in the figure on the right. Round answers to 3 places.



3. Let  $\vec{u} = \langle 2, 5 \rangle$ ,  $\vec{v} = \langle -10, 3 \rangle$ .

- (5 pts) Compute  $\vec{u} + \vec{v}$ . Sketch a graph of  $\vec{u}$ ,  $\vec{v}$ , and  $\vec{u} + \vec{v}$ .
- (5 pts) Compute  $\vec{u} - \vec{v}$ . Sketch a graph of  $\vec{u}$ ,  $\vec{v}$ , and  $\vec{u} - \vec{v}$ . Observe that  $\vec{u} - \vec{v}$  is equivalent to a vector from the tip of  $\vec{v}$  to the tip of  $\vec{u}$ . Show this on your graph.
- (5 pts) Find a unit vector in the direction of  $\vec{v}$ . I want an exact answer, here, not a decimal approximation.

4. (10 pts) A 100-pound weight is suspended from cables attached to the ceiling as shown in the figure on the right. Find the tension in each cable.

