MATH 1700: TAKE HOME 03 (20 POINTS)

DUE THE DAY OF TEST 3 AT THE BEGINNING OF CLASS

NAME: _____

DIRECTIONS: Make sure your work is neat and complete and uses the techniques demonstrated in class.

1. Explain why there are two triangles that satisfy: $\alpha = 50^\circ$, $a = 12$, and $c = 15$ and find them.

2. **FLASHBACK PROBLEM:** To measure the height of Godzilla, two sightings are taken one 100 feet behind the other. If the first angle of elevation is 37° and the second is 31°, what is the height of Godzilla?

   HINT: Use the Law of Sines ...

3. Consider a triangle where $a = 8$, $b = 6$, and $c = 12$.

   (a) Find the area of this triangle using Heron's Formula. Find an exact answer, then find a decimal approximation, rounded to two decimal places.

   (b) Solve this triangle. Round your answers to the nearest tenth of a degree.

4. Jeff and Carl head out from base camp. Jeff hikes 5 miles following a bearing of N15°W; Carl hikes 3 miles following a bearing of S40°E.

   (a) How far apart are Jeff and Carl? Round your answer to the nearest tenth of a mile.

   (b) If Carl wants to hike to Jeff's location, what bearing should he follow? Round your answer to the nearest tenth of a degree.

5. Ash departs from Tangelo Island on a bearing of N30°E and travels 20 nautical miles to Sunburst Island. From there, he departs on a bearing of S15°E traveling at a speed of 10 knots (nautical miles per hour.) After half an hour, Ash encounters a Tentacruel which injures Ash's Pikachu, so Ash needs to return to the nearest Pokémon Center (which happens to be on Tangelo Island.)

   (a) How far is Ash from Tangelo Island? Find an exact answer first, then use your calculator to round it to the nearest hundreth of a nautical mile.

   (b) Assuming Ash maintains his current speed of 10 knots, how long will it take him to teach Tangelo Island? Round your answer to the nearest minute.

   (c) What bearing should Ash set to head back to Tangelo Island? Round your angle to the nearest hundreth of a degree.

6. Gilligan sets his boat on a heading of N 63° W at a speed of 20 miles per hour (with respect to the water). The ocean current is moving at 10 miles per hour at a bearing of N 27° E.

   Round each of your answers below to two decimal places.

   (a) Let $\vec{v}$ be the velocity that Gilligan sets for the boat. Find the component form of $\vec{v}$.

   (b) Let $\vec{w}$ be the ocean current velocity. Find the component form of $\vec{w}$.

   (c) Find the true speed and heading of Gilligan's boat.

7. The Skipper sets a course for due North at 15 miles per hour (with respect to the water.) Three hours later, he finds his port of origin is 27 miles away at a bearing of S 42° W. Assuming the ocean current has been constant during the extent of his 'three hour tour,' find the speed and heading of the ocean current. Round your answers to two decimal places.

   HINT: Remember: the vectors here are modeling *velocities* which means the magnitudes of the vectors are *speeds*. 27 miles is **not** a *speed* ...

8. Let $\vec{v} =< -5, 10 >$ and $\vec{w} =< 4, -3 >$.

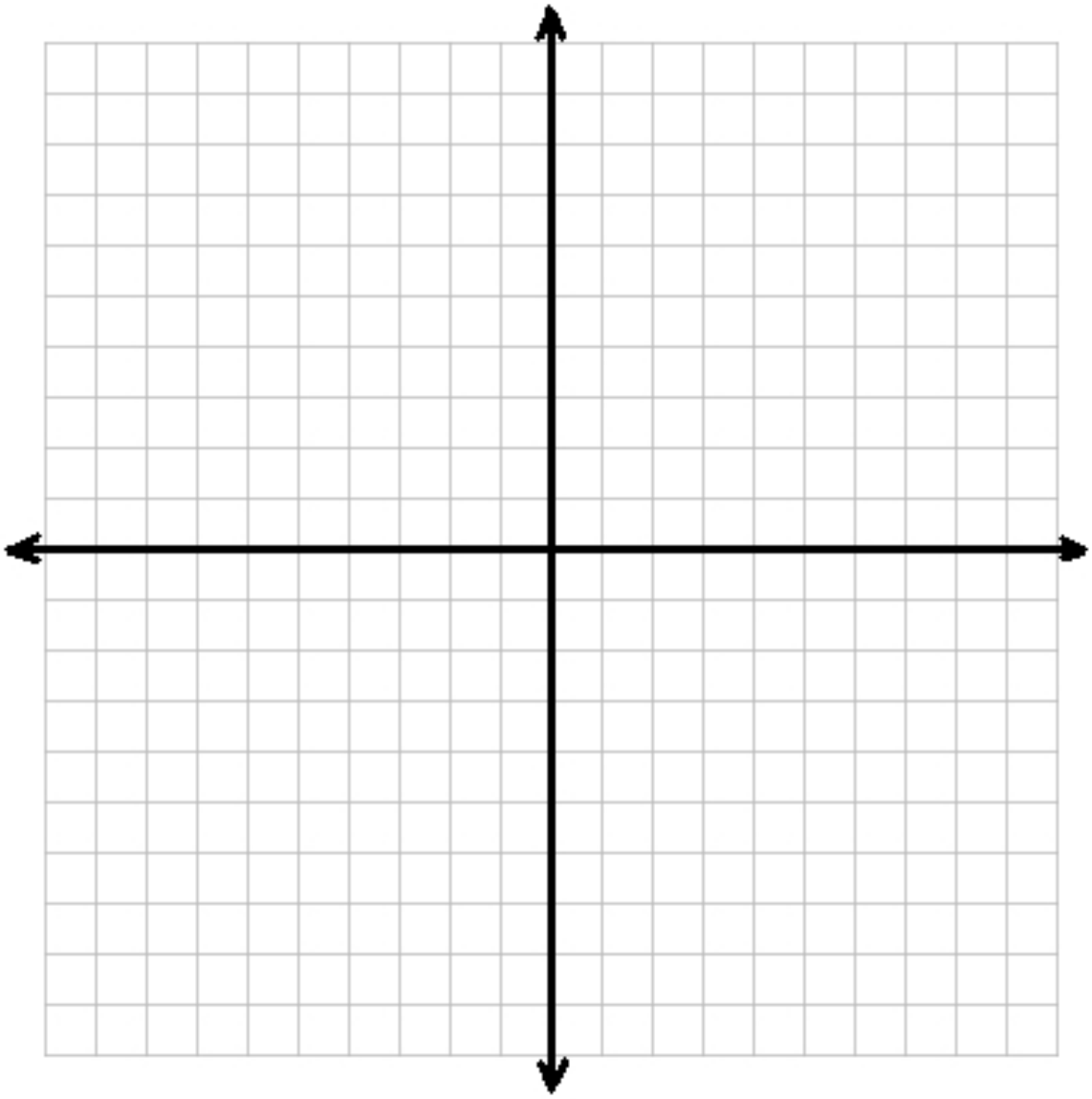
   (a) Find $\vec{v} \cdot \vec{w}$, $\|\vec{v}\|$, and $\|\vec{w}\|$.

   (b) Find the angle between $\vec{v}$ and $\vec{w}$. (Round the angle to the nearest tenth of a degree.)

   (c) Find and simplify $\vec{p} = \text{proj}_{\vec{w}}\vec{v}$.

   (d) Find $\vec{q} = \vec{v} - \vec{p}$, and use the dot product to show $\vec{q} \perp \vec{w}$.

(e) Graph $\vec{v}$ and $\vec{w}$ in standard position. Graph $\vec{p}$ in standard position and $\vec{q}$ so that the initial point of $\vec{q}$ is the terminal point of $\vec{p}$ to show geometrically $\vec{v} = \vec{p} + \vec{q}$.



9. Find the work done against gravity pushing a 75 pound object up a 60° incline for 20 feet. Round your answer to the nearest foot-pound.