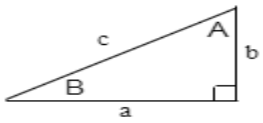
Math 131 Unit 3 Written Paper and Pencil Homework - SP 2020

Write your work on a separate sheet of paper. Show your work as in class.
For decimal answers, round angles to one decimal place and round legs to two decimal places.

Unit 3, Section 4.1

1. Find the exact value of each following expression. $\cot 40° - \frac{\sin 50°}{\sin 40°}$

2. Solve the right triangles using the given information.



a) a = 7, B = 50°; find b, c, and A

b) a = 2, b = 8; find c, A, and B

3. A right triangle contains an angle of $\frac{\pi}{8}$ radians. If one leg is a length of 3 meters, what is the length of the hypotenuse? There are two answers.

4. Find the distance from A to C across the gorge illustrated in the figure.

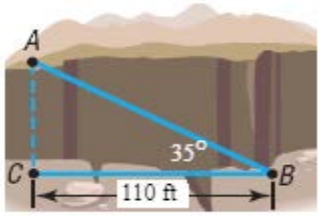


Figure 1; Angle B is 35°, leg a is 110 feet, find leg b.

5. Find the distance from A to C across the pond illustrated in the figure.

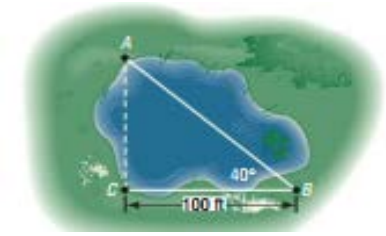


Figure 2; Angle B = 40°, leg a = 100 feet, find leg b.

6. A 22-foot extension ladder leaning against a building makes a 70° angle with the ground. How far up the building does the ladder touch?

Unit 3, Section 4.2

1. Solve each triangle.

a) A = 50°, C = 20°, a = 3 b) A = 70°, B = 60°, c = 4

2. In the following problems, two sides and an angle are given. Determine whether the given information results in one triangle, two triangles, or no triangle at all. Solve any resulting triangle(s).

a) b = 4, c = 3, B = 40° b) b = 2, c = 3, B = 40° c) b = 4, c = 5, B = 95°

3. The highest bridge in the world is the bridge over the Royal Gorge of the Arkansas River in Colorado. Sightings to the same point at water level directly under the bridge are taken from each side of the 880-foot-long bridge, as indicated in the figure. How high is the bridge?

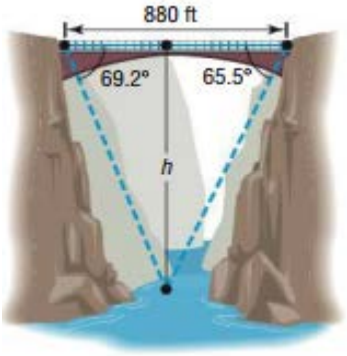


Figure 3; bridge 880 feet across gorge with height h and angles 69.2° and 65.5°.

4. Two runners in a marathon determine that the angles of elevation of a news helicopter covering the race are 38° and 45°. If the helicopter is 1700 feet directly above the finish line, how far apart are the runners?

5. Pat needs to determine the height of a tree before cutting it down to be sure that it will not fall on a nearby fence. The angle of elevation of the tree from one position on a flat path from the tree is 30°, and from a second position 40 feet farther along this path it is 20°. What is the height of the tree?

Unit 3, Section 4.3

1. Solve the triangle.

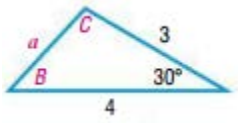


Figure 4; Angle A = 30°, leg b = 3, leg c = 4.

2. Solve each triangle.

a) a = 2, c = 1, B = 10° b) a = 4, b = 3, c = 6

3. Solve each triangle using either the Law of Sines or the Law of Cosines.

a) A = 50°, B = 55°, c = 9 b) a = 4, c = 5, B = 55°

4. A golfer hits an errant tee shot that lands in the rough. A marker in the center of the fairway is 150 yards from the center of the green. While standing on the marker and facing the green, the golfer turns110° toward her ball. She then paces off 35 yards to his ball. How far is the ball from the center of the green?

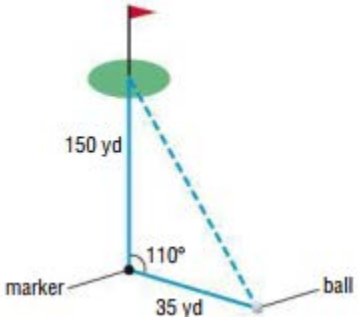


Figure 5; Angle A = 110°, green to marker = 150 yards, marker to golf ball = 35 yards, find green to golf ball.

5. The height of a radio tower is 500 feet, and the ground on one side of the tower slopes upward at an angle of 10°.

a) How long should a guy wire be if it is to connect to the top of the tower and be secured at a point on the sloped side 100 feet from the base of the tower?

b) How long should a second guy wire be if it is to connect to the middle of the tower and be secured at a position 100 feet from the base on the flat side?

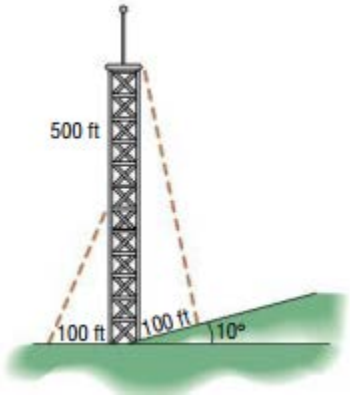


Figure 6; Radio Tower with two guy wires.

Unit 3, Section 4.4

1. Find the area of each triangle. Round to two decimal places.

a) a = 6, b = 4, C = 60° b) a = 3, b = 3, c = 2

Unit 3, Section 5.1

1. Plot each point given in polar coordinates.

a) $\left(2, -\frac{5\pi}{4}\right)$ b) $\left(-3, -\frac{3\pi}{4}\right)$

2. The polar coordinates of a point are given. Find the exact value of the rectangular coordinates of each point.

a) $\left(-2, \frac{2\pi}{3}\right)$ b) $\left(-3, -\frac{3\pi}{4}\right)$

3. The rectangular coordinates of a point are given. Find the exact value of the polar coordinates of each point.

a) $(-3,\ 3)$ b) $\left(-2, -2\sqrt{3}\right)$

Unit 3, Section 5.2

1. Transform each polar equation to an equation in rectangular coordinates. Then identify and graph the equation.

a) r = 2 b) $\theta = -\frac{\pi}{4}$ c) $r \sin\theta = -2$

d) $r = 2\sin\theta$ e) $r \csc\theta = -2$

Unit 3, Section 5.4 – Find the exact values.

1. The vector **v** has initial point P and terminal point Q. Write **v** in the form a**i** + b**j**; that is; find the position vector.

a) P = (-3, 2); Q = (6, 5)

2. Find ||**v**||.

a) **v** = 6**i** + 2**j**

3. Find each quantity if **v** = 3**i** – 5**j** and **w** = -2**i** + 3**j**.

a) ||**v** + **w**|| b) ||**v**|| + ||**w**||

4. Find the unit vector in the same direction a **v**.

a) **v** = -5**i** + 12**j**

5. Write the vector **v** in the form a**i** + b**j**, given its magnitude ||**v**|| and the angle α it makes with the positive x-axis.

a) ||**v**|| = 15, α = 315°

6. Find the direction angle of **v**.

a) **v** = -5**i** – 5**j**

Unit 3, Section 5.5

1. A) Find the dot product **v** · **w.** Find the exact value.

B) Find the angle between **v** and **w**.

C) State whether the vectors are parallel, orthogonal, or neither.

a) **v** = **i** + **j**, **w** = -**i** + **j** b) **v** = **i** + $\sqrt{3}$**j**, **w** = **i** – **j** c) **v** = 3**i** – 4**j**, **w** = 9**i** – 12**j**