Mth 114 – Trigonometry – Practice Exam 1 Solutions

NOTE: This exam should not be taken as a complete list of possible problems. It is merely intended to be an example of the length and difficulty level of the regular exam. To best utilize it as a *practice* exam, give yourself 55 minutes with no distractions. Try to emulate the classroom environment as much as possible. <u>Calculators are NOT ALLOWED on this portion.</u>

1. Find the complement and supplement of 75°. Label your answers.

The complement is 15° and the supplement is 105°.

2. Find the angle of smallest positive measure coterminal with -75° .

The smallest positive angle coterminal with -75° is 285° .

3. Use the given figure to find the measures of the numbered angles. (Assume lines *m* and *n* are parallel.)



4. A surveyor is attempting to measure the width of a river. He makes the measurements accompanying the figure below. Using similar triangles and the measurements below, find the width *w* of the river. All measurements are given in meters.



5. Find the values of the six trigonometric functions for the angle in standard position having the point (-4, -3) on its terminal side.

$r = \sqrt{(-4)^2 + (-3)^2} = 5$	
$\sin\theta = \frac{y}{r} = \frac{-3}{5} = -\frac{3}{5}$	$\csc\theta = -\frac{5}{3}$
$\cos\theta = \frac{x}{r} = \frac{-4}{5} = -\frac{4}{5}$	$\sec\theta = -\frac{5}{4}$
$\tan \theta = \frac{y}{x} = \frac{-3}{-4} = \frac{3}{4}$	$\cot \theta = \frac{4}{3}$

6. Suppose the terminal side of an angle in standard position is given by the equation $y = -x, x \ge 0$. Sketch the smallest positive such angle θ and find the values of the six trigonometric functions of θ .



7. Given that $\sin \theta = \frac{3}{5}$ and θ is in quadrant II, find the value of $\tan \theta$.

$$\sin \theta = \frac{y}{r} = \frac{3}{5}$$
, so $x^2 + y^2 = r^2 \implies x^2 + 3^2 = 5^2 \implies x = \pm 4$ (skipping some steps)
Since θ is in quadrant II, $x = -4$ and $\tan \theta = \frac{y}{x} = \frac{3}{-4} = -\frac{3}{4}$

8. Given triangle ABC, find exact values for $\sin A$, $\cos A$, and $\tan A$.



9. Find one solution to the equation $\cos \theta = \sin 2\theta$. (Assume θ is acute.)

 $\cos \theta = \sin 2\theta$ $\cos \theta = \cos(90 - 2\theta)$ $\theta = 90 - 2\theta$ $3\theta = 90$ $\theta = 30$

10. Find all values of θ , if θ is in the interval $[0^\circ, 360^\circ)$ and $\tan \theta = -\sqrt{3}$.

 $\tan \theta = -\sqrt{3} = \frac{y}{x}$ So $y = -\sqrt{3}$ and x = 1 (so $\theta = 300^{\circ}$) or $y = \sqrt{3}$ and x = -1 (so $\theta = 120^{\circ}$) 11. Find the exact value for each expression.

a.
$$\cot 45^\circ$$

$$\cot 45^\circ = \frac{1}{1} = 1$$

b. sec 225°

$$\sec 225^{\circ} = \frac{1}{\cos 225^{\circ}} = \frac{1}{\frac{-1}{\sqrt{2}}} = -\sqrt{2}$$

c. $\cos(-150^{\circ})$

$$\cos(-150^{\circ}) = \frac{-\sqrt{3}}{2} = -\frac{\sqrt{3}}{2}$$

d. tan 495°

$$\tan 495^\circ = \tan 135^\circ = \frac{1}{-1} = -1$$

e. $csc(-60^{\circ})$

$$\csc(-60^\circ) = \frac{1}{\sin(-60^\circ)} = \frac{1}{\frac{-\sqrt{3}}{2}} = -\frac{2\sqrt{3}}{3}$$

Mth 114 – Trigonometry – Practice Exam 1 – Part II

Calculators ARE ALLOWED on this portion.

12. Convert 34° 24' 35" to decimal degrees.

$$34^{\circ} \ 24' \ 35'' = \left(34 + \frac{24}{60} + \frac{35}{3600}\right)^{\circ} \approx 34.4097^{\circ}$$

13. Convert 59.0854° to degrees, minutes, and seconds.

 $59.0854^\circ = 59^\circ (0.0854 \cdot 60) = 59^\circ 5.124 = 59^\circ 5' (0.124 \cdot 60) = 59^\circ 5' 7''$

14. In the picture below, Happy is trying to estimate the height of a tree. He stands 20 ft away from the trunk of the tree and makes an angle of 35° when looking at the top of the tree. If Happy is 6 ft tall, approximately how tall is the tree?



15. The bearing from Atlanta to Macon is S 27° E, and the bearing from Macon to Augusta is N 63° E. An automobile traveling at 60 mph needs 1¼ hr to go from Atlanta to Macon and 1¾ to go from Macon to Augusta. Find the distance from Atlanta to Augusta.

I didn't have the space to draw the triangle, but you should first confirm that the triangle formed is indeed a right triangle. That done, the distance from Atlanta to Macon is $60 \cdot 1.25 = 75$ miles and the distance from Macon to Augusta is $60 \cdot 1.75 = 105$ miles. Since the Atlanta-Augusta portion is the hypotenuse of a right triangle, the distance is $\sqrt{75^2 + 105^2} \approx 129$ miles.

16. Happy wants to determine the height of another tree. Unfortunately, he isn't able to walk completely up to the tree. Instead, he measures the angle of elevation from a particular point on the ground to the top of the tree is 36.7°. He then moves back 50 ft. From the second point, the angle of elevation to the top of the tree is 22.2°. Find the height of the tree.

This is similar to the problem completed in class on Wednesday. We set up two equations with two unknowns. Let x be the distance to the tree from the closer point, and let h be the height of the tree. Then,

$$\tan 36.7^{\circ} = \frac{h}{x} \implies h = x \tan 36.7^{\circ}$$
$$\tan 22.2^{\circ} = \frac{h}{x+50} \implies h = (x+50) \tan 22.2^{\circ}$$
Setting the two equations equal to each other and solving, we get that $x = \frac{50 \tan 22.2^{\circ}}{\tan 36.7^{\circ} - \tan 22.2^{\circ}} \approx 60$ feet.
The tree is then $h = x \tan 36.7^{\circ} \approx 45$ feet tall.