MATH 27
Exam #4
Spring 2018

Name: _____

Roll #: _____ Score: _____/100

Work each problem in the space provided on the exam page. Full or partial credit will be given only if all work has been shown and the answers are clearly indicated. Each numbered problem is worth 10 points.

1. Answer **T** if always true, **F** if otherwise.

   _____ a) The equation $\sin^2 x = 1 - \cos^2 x$ is an identity.

   _____ b) The equation $\sin^2 x + \sin x - 6 = 0$ has no real solutions.

   _____ c) The Law of Cosines can be applied to a right triangle.

   _____ d) The Law of Sines can be applied to the AAA Case.

   _____ e) Three segments with lengths 4 cm, 10 cm, and 5 cm can be used to form a triangle.

---

2. a) Simplify the following expression to a single trigonometric function.

$$\frac{\cos x}{1+\sin x} + \frac{1+\sin x}{\cos x}$$

b) Verify the following identity:

$$\sec\theta - \cos\theta = \tan\theta \cdot \sin\theta$$

3. Find the **exact** solutions to the following equations on the interval $0 \le x < 2\pi$.

a) $\tan x \cdot \sin^2 x = \tan x$

b) $2\cos^2 x + 3\cos x - 2 = 0$

4. a) Use the identity for the sine of a difference to find the **exact** value of $\sin 15°$.

b) Find the **exact** value of the expression: $\cos\left[\cos^{-1}\left(\frac{4}{5}\right) - \sin^{-1}\left(-\frac{3}{5}\right)\right]$ without using a calculator.

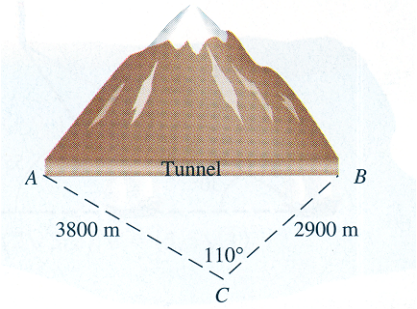
5. Suppose that $\sin\theta = -\frac{4}{5}$ and that $\frac{3\pi}{2} < \theta < 2\pi$. Find the **exact** values of the following:

a) $\sin\left(\frac{\theta}{2}\right)$

b) $\sec\left(\frac{\theta}{2}\right)$

6. A small fire is sighted from ranger stations *A* and *B*. Station *A* is 2.7 miles due west of station *B*. The bearing of the fire from station *A* is N48°E, and the bearing of the fire from station *B* is N35°W. How far is the fire from station *A*? (Give the answer to the nearest tenth of a mile.)

7. To measure the distance through a mountain for a proposed tunnel a point C is chosen that can be reached from each end of the tunnel If $AC = 3800$ meters, $BC = 2900$ meters, and angle $C = 110°$, find the length of the tunnel to the nearest meter.

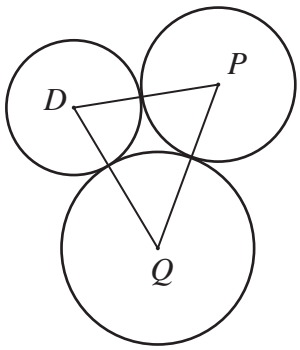


8. A dime, a penny, and a quarter are placed on a table so that they just touch each as shown in the adjacent figure. Let D, P, and Q be the respective centers.

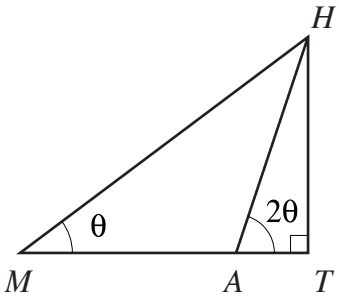
   [*Note*: The **diameters** of the coins are 1.75 cm, 2.00 cm, and 2.50 cm respectively.]

   a) Find the measure of the smallest angle.

   b) Find the area of the triangle DPQ.



9. **The following problem is to be done without the use of a calculator.**
In the accompanying figure, $MT = 4$, $TH = 3$, and $\angle HAT = 2\angle HMT$.
Use double angle identities to determine the **exact** values of AH and AT.



10. FREE!!