MATH 120R - TEST 3 Review

- Converting Between Degrees and Radians:

$$1 \text{ radian } = \frac{180^\circ}{\pi}$$

$$1^\circ = \frac{\pi}{180^\circ}$$

- The arc length, s, spanned in a circle of radius r by an angle θ in radians $0 \leq \theta \leq 2\pi$, is given by

$$s = r\theta$$

- For $y = A\sin(B(t-h)) + k$ and $y = A\cos(B(t-h)) + k$,
  - $|A|$ is the amplitude
  - h is the horizontal shift
  - $|B|$ is the angular frequency; that is the number of cycles completed in $0 \leq t \leq 2\pi$
  - $\dfrac{2\pi}{|B|}$ is the period
  - $y = k$ is the midline

- $\tan\theta = \dfrac{\sin\theta}{\cos\theta}$ $\qquad \cos^2\theta + \sin^2\theta = 1 \qquad 1 + \tan^2\theta = \sec^2\theta$
  - $\sec\theta = \dfrac{1}{\cos\theta}$
  - $\csc\theta = \dfrac{1}{\sin\theta}$
  - $\cot\theta = \dfrac{1}{\tan\theta} = \dfrac{\cos\theta}{\sin\theta}$

- If θ is an angle is a right triangle,

$$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}, \qquad \cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}, \qquad \tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

- Law of cosines: For a triangle with sides a, b, c and angle C opposite side c, we have

$$c^2 = a^2 + b^2 - 2ab\cos C.$$

- Law of sines: For a triangle with sides a, b, c opposite angles A, B, C respectively:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

- $\cos(-t) = \cos(t), \qquad \sin(-t) = \sin(t), \qquad \tan(-t) = \tan(t)$

- $\sin t = \cos(t - \dfrac{\pi}{2}), \qquad \cos t = \sin(t + \dfrac{\pi}{2})$

1. Solve the equations with $0 \leq a \leq 2\pi$:
   (a) $3\sin a + 4 = 5$
   (b) $\tan a = \sqrt{3} - 2\tan a$
   (c) $\tan^2 a = 2\tan a$
2. Solve the equation with $0 \leq a \leq \pi$:
   $\sin^2 a - 4\cos^2 a = 1$
3. Solve $3\sin^2 t = 5 - 5\cos t$ for $0 \leq t \leq \pi$.
4. A ladder 3 meters long leans against a house, making an angle α with the ground. How far is the base of the ladder from the base of the wall, in terms of α?
5. A UFO is first sighted at a point P_1 due east from an observer at an angle of 25 from the ground and at an altitude (vertical distance above the ground) of 200 m . The UFO is next sighed at a point P_2 due east at an angle of 50 and an altitude of 400 m. What is the distance from P_1 to P_2?
6. State the amplitude, period, the midline, and horizontal shifts for the function $y = 3\sin(\pi(x - a)) + 2$ and then sketch the graph. Label all important points.
7. Find the area of the triangle : (see figure 7.11 page 300 in your book)
8. An isosceles triangle has sides 5in,5in, and 6in find all the angles of the triangle.
9. Find a formula, using the sine function, for your height above the ground after t minutes on the ferris wheel if the ferris wheel is 35 meters in diameter and boarded at ground level. The wheel completes one full revolution every 5 minutes. At $t = 0$ you are in the three o'clock position and ascending.
10. Complete the square to find the vertex of the parabola: $y = 5x^2 - 5x + 7$.
11. If $\sin\theta = \dfrac{a}{2}$ find $\cos\theta$ and $\tan\theta$ in terms of a.