Math 120 Chapter 16 through 20 Review

The final exam is cumulative (It covers Chapters 1 - 20). That is, it could include ANYTHING from this quarter. On the website you will find review sheets for the other chapters 1-15. The questions on the final will force you to apply material from lecture, the text, and/or the homework. A good idea is to first review those topics which you struggled with this quarter. It is also a good idea to look at old final exam questions which can be found at: http://www.math.washington.edu/ m120/testindex.html

1. **Chapter 16 - Circular Motion**
   - Angular Speed $= \omega = \frac{\text{change in angle}}{\text{change in time}}$.
   - Linear Speed $= v = \frac{\text{change in distance}}{\text{change in time}}$
   - You should be able to work with RPM's and you should know how to convert between angular speed and linear speed (Remember you need to know the radius). (Like in HW 16.1 and 16.3)
   - 3 key formulas which only apply when θ is in RADIANS and ω is in RADIANS per unit time:
     - $s = r\theta$, Arc Length = (radius)(angle)
     - $\theta = \omega t$, Angle = (angular speed)(time)
     - $v = \omega r$, Linear Speed = (angular speed)(time)
   - You should be comfortable with Belt and Wheel problems (Like HW 16.2, 16.5, 16.6, 16.7, 16.8)
2. **Chapter 17 - Circular Functions**
   - $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}} \quad \cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}} \quad \tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$.
   - Know how to use these functions to answer questions about right triangles. (Like HW 17.3, 17.7, 17.8, 17.11)
   - Given a circle of radius r with the center as the origin, consider the point that is obtained by rotating by an angle of θ in standard position. Then the (x, y) coordinates of this point are given by $x = r\cos(\theta)$ and $y = r\sin(\theta)$. We obtained this θ in a couple steps to get the general circular motion equations:

     $$x = r\cos(\theta_0 + wt) \qquad y = r\sin(\theta_0 + wt),$$

     where
     - r = the radius
     - θ_0 = the angle in standard position that corresponds to $t = 0$.
     - ω = the angular speed taken as positive for counterclockwise motion and negative for clockwise motion.
     - t = time.
   - Be able to use the coordinate formula to answer questions about locations on a circle, even when the information given does not start in standard position. (Like HW 17.1, 17.4, 17.5, 17.6, 17.9, 17.10, 17.12)
   - Understand how to use $\tan(\theta)$ and $-\frac{1}{\tan(\theta)}$ to find the slopes of lines with given angles. (Like HW 17.1(c) and 17.2)
3. **Chapter 18 - Trigonometric Functions**
   - Be aware of the basic graphs of $\sin(\theta)$, $\cos(\theta)$, and $\tan(\theta)$.
   - Know the following key identities:
     - $\sin^2(\theta) + \cos^2(\theta) = 1$, (please review how to use this notation).
     - $\sin(-\theta) = -\sin(\theta)$ and $\cos(-\theta) = \cos(\theta)$.
     - $\sin(\theta) = \sin(\theta + 2\pi n)$ and $\cos(\theta) = \cos(\theta + 2\pi n)$ for $n = 0, \pm 1, \pm 2, \ldots$
     - $\cos(\theta) = \sin(\theta + \frac{\pi}{2})$ and $\sin(\theta) = \cos(\theta - \frac{\pi}{2})$.

4. **Chapters 19 and 20 - Sinusoidal Modeling and Inverse Circular Functions**: Know all the problems assigned from Ch. 19 and 20.

- There are three main components to answering questions in these sections
  (a) Constructing and sketching the model.
  (b) Solving equations involving the model using inverse circular functions.
  (c) Interpreting your solutions (i.e. finding other solutions).
- The general sinusoidal model is: $y = A\sin\left[\frac{2\pi}{B}(x - C)\right] + D$
  - $A =$ amplitude $= \frac{\text{MAX Y VALUE} - \text{MIN Y VALUE}}{2}$
  - $D =$ mean $= \frac{\text{MAX Y VALUE} + \text{MIN Y VALUE}}{2}$
  - $B =$ period $=$ how long it takes the wave to repeat $=$ distance from peak to peak
  - $C =$ phase shift $=$ x-coordinate of a peak $- \frac{B}{4}$
    $=$ an x-coordinate where the graph crosses the mean line and is increasing
- Recall that when you use $\sin^{-1}(x)$, you only get the principal solution. That is, the solutions which is closest to the phase shift, C.
- Be able to find the symmetric solution, finding the distance to the nearest peak (or valley) and using this to get the solution on the other side of the peak (or valley).