The final exam is cumulative (It covers Chapters 1 - 23). That is, it could include ANYTHING from this quarter. The questions 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 exam questions from Taggart and Conroy which can be found at

http://www.math.washington.edu/~m120/testindex.html

The website includes review sheets for the material from Chapters 1 - 16. This review sheet discusses some of the key points from Chapters 17 - 23.

1. **Sinusoidal Modeling and Inverse Circular Functions (Ch. 17 and 18)**
   - 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).

2. **Exponential Modeling and Logarithms (Ch. 19, 20, and 21)**
   - The general exponential model is of the form \( y = A_0 b^x \), which can also be written in the form \( y = A_0 e^{ax} \). Recall that the relationship is \( a = \ln(b) \).
   - Understand how to find the general exponential model when you are given two pieces of information.
   - Be able to use the basic natural logarithm rules to solve equations with variables in the exponent.
     - \( \ln(ab) = \ln(a) + \ln(b) \)
     - \( \ln\left(\frac{a}{b}\right) = \ln(a) - \ln(b) \)
     - \( \ln(b^x) = x \ln(b) \)

3. **Parametric Equations and Linear Motion (Ch. 22 and 23)**
   - Understand the basic idea behind parametric equations. In particular, how do you sketch a graph when given parametric equations.
• Recall, how we give parametric equations for circular motion.

• In general, given the following:
  – A circle with radius $r$ and center $(x_c, y_c)$.
  – An angular speed of $\omega$ in the counterclockwise direction in units RADIANS per time.
  – A start angle of $\theta_0$.

The parametric equation for the circular motion is

\[
\begin{align*}
x(t) &= x_c + r \cos(\theta_0 + \omega t) \\
y(t) &= y_c + r \sin(\theta_0 + \omega t)
\end{align*}
\]

• Understand how to model motion at a constant speed on a straight line.

• In general, given the following:
  – $s$ = the speed along the straight line
  – $v_x$ = the speed in the $x$ direction
  – $v_y$ = the speed in the $y$ direction
  – $(x_1, y_1)$ is the starting point and $(x_2, y_2)$ is the point reached after $T$ units of time.

The parametric equations for the linear motion is

\[
\begin{align*}
x(t) &= x_1 + v_x t \\
y(t) &= y_1 + v_y t
\end{align*}
\]

and we have the relationships

\[
\begin{align*}
v_x &= \frac{x_2 - x_1}{T} \\
v_y &= \frac{y_2 - y_1}{T}
\end{align*}
\]

\[
\begin{align*}
s^2 &= v_x^2 + v_y^2 \\
\frac{v_y}{v_x} &= \text{the slope of the line}
\end{align*}
\]

• Usually, in linear motion problems, you are given only a couple of pieces of information and you have solve for the other parts.