Study Guide and Sample Problems for Exam 3 Math 1155 Rogness

Here are some tips about what to study for the third midterm. It covers sections 4.6 and 4.7, Chapter 5, and sections 6.1 and 6.3. Practice problems are on the next page.

§4.6: (Logarithmic and Exponential Equations): You already had to do some manipulations with logs and exponents on an exam, so any problem on this section would probably be small scale (i.e. in the multiple choice section), or it would be part of a problem from Section 4.7 below.

§4.7: (Compound Interest): I could ask you short questions about this section in the multiple choice section – how changing the number of times per year the interest is compounded affects the effective interest rate, for example. I could also ask you to perform a certain calculation using the formula for compound interest, $A = P(1 + \frac{r}{n})^{nt}$. (In the case of continuous compounding, the equation is $A = Pe^{rt}$.) Note that solving some of those problems involves logarithms and exponentials. Make sure to practice some of these in case you've forgotten how they go!

§5.1: (Angles): Since you weren't officially assigned homework from this section, I won't specifically test you on it. But understanding the information about angles in 5.1 is crucial to dealing with the rest of Chapter 5. Note that most of the exam is likely to be in radians, not degrees.

§§5.2, 5.3: (Trig Functions and Properties): You should know these sections well. You should absolutely know the definitions of all 6 trig functions, using either the unit circle approach or the triangle approach (where sin is opposite over hypoteneuse, etc.). You should know the properties of the functions well enough that, if I tell you a few facts, such as

- the sign ($\pm$) of one or more of the trig functions, and
- the value of one of the trig functions

you'd be able to find the values of all 6 functions. It's also quite likely that you'd have to use the trig functions for some "applied" (i.e. "word") problem.

§§5.4, 5.5, 5.6: (Graphing): First concentrate on learning everything about sin and cos. The graph of tan will show up on the exam, but it won't be worth as many points. The graphs of cot, sec, and csc are important and have their uses, but the first three will show up more often in a Calculus course and, hence, in our course as well. It's virtually certain that you'll have to do some sinusoidal curve fitting, either:

- Given a picture of wave, find the corresponding function $f(x) = A\sin(\omega x - \phi)$, or
- Given an equation like that, accurately draw at least one cycle of the wave.

In fact, you could conceivably have to do both!

§6.1: (Arcsin, Arccos, and Arctan): Standard test questions about the inverse trig functions include computing things like $\arcsin(\sin(\theta))$, $\cos(\arccos(x))$ and so on; the goofy ranges for the angles come into play in these problems.

§6.3: (Trigonometric Identities): This is an important section, but because we just covered it, I won't include anything too awful. You might be asked to establish a less complicated identity, or perhaps do some kind of factoring and cancelling to simplify a trig expression. You should understand the difference between a conditional equation and an identity (trigonometric or not).

How to use the practice questions below: This list of sample problems should give you an idea of what I think is important for the first midterm. The real midterm will not simply be these problems with a few numbers changed, but the real problems will at least cover the same concepts. (In a few cases, the problems below are intended to check basic skills, and probably won't show up at all on the exam.)

Therefore, when you do these problems you should do more than sit in front of your textbook and compare them to examples until you can do them. You should see, for instance, that I think the equation $y = A\cos(\omega x - \phi)$ is important. So instead of only learning how to do the sample problem here, you shold learn what the different pieces of this equation mean, so that you can do any problem related to it.

A favorite trick of teachers is to give a sample midterm problem, and then "reverse" it on the exam. For example, on the exam I could give you a picture of a certain sine wave and ask you to find an equation $y = A\sin(\omega x - \phi)$ whose graph matches the picture. (And this is why I say you should understand the concepts behind the sample problems, and not just the sample problems themselves.)

(1) Given $y = 3\cos(\pi x - \frac{\pi}{2})$, find the amplitude, period, and phase shift of this function. Graph at least one period.

(2) Given that $\sin(\theta) = 1/2$ and $\cos(\theta) < 0$, find the values of all the trig functions.

(3) Find exact values of the trig functions for $\theta = -\pi/4, 3\pi/4$, and $\pi/4$.

(4) Show that
$$\frac{\cot(\theta)\sin(\theta)}{\sec(\theta)} + \frac{1}{\csc^2(\theta)} = 1$$
(Hint: write everything in terms of sines and cosines.)

(5) Find the points on the unit circle corresponding to the following angles:
$$0, \pi/6, \pi/4, \pi/3, \pi/2, 2\pi/3, 3\pi/4, 5\pi/6, \pi$$
You may wish to do the same for a circle of radius 2, as well.

(6) Find $\cos^{-1}(\cos(-\pi/4))$.

(7) Convert 95° to radians. Then convert 1 radian to degrees.

(8) Graph $y = \tan\left(x - \frac{\pi}{2}\right)$.

(9) (Additional problems from the book) Chapter 4 Review: #90, 91. Chapter 5 Review: All blue-numbered problems. Chapter 6 Review: blue-numbered problems through #35.