Topics for Exam 4
Math 19, Spring 2013

General information. Exam 4 will be a timed test of 80 minutes, covering 5.3–5.6, 7.1–7.3, and 6.1–6.4 of the text, as well as the inverse trig handout. Most of the exam will be based on the homework and quizzes from those sections. If you can do all of those problems, and you know and understand all of the ideas behind them, you should be in good shape.

You are allowed to use a calculator (but **not** a calculator that can do algebra, like the TI-89 or TI-92) and notes on **ONE** 3×5 note card (both sides).

As mentioned above, your first priority should be to understand the homework and quizzes and the ideas behind them. Besides the list of things you should know, below, you should also be familiar with everything specially emphasized in the text. If time permits, try to do some of the problems that have answers in the back of the book.

Section 5.3. Basic shapes of graphs of sine and cosine. Vocabulary (descriptions, pictures): periodic, period, one complete period, amplitude, phase shift. Key features of graphs: peaks, valleys, midpoints. Key features happen once each 1/4 period. From formula to amplitude, period, and phase shift, and vice versa. Sine and cosine curves with variable amplitude.

Section 5.4. Basic shapes of graphs of tangent, cotangent, secant, and cosecant. Periods: $\tan x$ and $\cot x$; $\sec x$ and $\csc x$. Using $\cos x$ and $\sin x$ to graph $\sec x$ and $\csc x$. Locations of key features (zeros, asymptotes, peaks, valleys); key features happen every half period for $\tan x$ and $\cot x$, every 1/4 period for $\sec x$ and $\csc x$.

Section 5.5 and inverse trig handout. Inverse trig functions: $\sin^{-1} x$, $\cos^{-1} x$, $\tan^{-1} x$. Definitions, domains, ranges. Evaluating specific values of inverse trig functions; evaluating expressions like $\sin\left(\cos^{-1} x\right)$.

Section 5.6. Idea of simple harmonic motion: From picture/description, to amplitude, period, frequency, to formula. Interpreting formulas. When to use sin or cos? Damped harmonic motion: Basic formulas, damping constant c.

Section 7.1. Fundamental trig identities: Definitions (unit circle, other functions in terms of $\sin x$ and $\cos x$), MOATI and children (= Pythagorean identities), even-odd identities. Proving trig identities: Start with one side, use fundamental identities to "simplify" to match the other. Sometimes: Convert all to sin and cos; trickery.

Section 7.2. Addition and subtraction formulas: $\sin(s \pm t)$, $\cos(s \pm t)$. Using addition and subtraction formulas to calculate exact values of trig functions.

Section 7.3. Double-angle: $\sin 2x$, $\cos 2x$. Power-lowering: $\sin^2 x$, $\cos^2 x$. Half-angle: $\sin \dfrac{x}{2}$, $\cos \dfrac{x}{2}$. Finding exact values of trig functions.

Section 6.1. Converting degrees and radians. Coterminal angles.

Section 6.2. SOHCAHTOA trig; $c^2 = a^2 + b^2$. Solving right triangles.

Section 6.3. Using triangles to compute trignometric functions of angles not in first quadrant; trig and non-unit circles.

Section 6.4. Using triangles to compute inverse trig functions.

Not on exam. (5.1) Reference numbers. (5.5) Inverse secant, cosecant, and cotangent. (7.1) Cofunction identities. (7.2) $\tan(s \pm t)$ formulas; sums of sines and cosines. (7.3) $\tan(2x)$, $\tan\left(\dfrac{u}{2}\right)$ formulas; product-to-sum formulas, sum-to-product formulas. (6.1) Length of an arc, area of a sector, linear speed and angular speed. (6.3) Area of a triangle.