Math 229: Review for Test 2

Suggested Review Problems:

Chapter 8 Review, page 690: 1, 9, 11. 13. 17, 24, 27, 28, 29, 30, 32

Even Answers #24: $y = 5\cos(\frac{\pi}{5}x)$

#28 $\frac{\pi}{2}$ #30: $-\frac{\pi}{4}$ #32: $-\frac{\pi}{3}$

Chapter 8 Test, page 692: 1, 14, 17, 18, 23, 50 (for #17 and 18, you do not have to graph!)

Even Answers: #18: Amp = 8, Period = $\frac{12}{7}$. Phase Shift = -3, midline is y = 6

#50: In radians, the angle of elevation of the roadway is .0699 radians or about 4 degrees

Modeling: "Try It" #11, page 655 (The answer is in the back of the book in the "Try It Answers" section. Be sure to sketch a graph of the weight's motion before finding the equation!)

Even and Odd Functions: Review these problems from your homework: 8.2: 14 – 18 all.

Most of the test will have problems similar to the review exercises so I STRONGLY encourage you to thoughtfully do/review these problems. Try to do these problems without looking at your notes and without looking at the answers in the back of the text; i.e., treat the problems as a practice exam.

If, for any of the problems, you have to look at notes or reverse engineer the solution from the answer, then you need to go back and practice more of that type of problem!

Bring your scientific calculator to the exam. (Graphing calculators are not allowed on the test.)

What you should have memorized or can easily find:

- Cosine and Sine values for all multiples of pi and odd multiples of pi/2
- The basic graphs for $y = \sin x$, $y = \csc x$, $y = \cos x$, $y = \sec x$, and $y = \tan x$, $y = \tan^{-1} x$

Section 8.1: Graphs of **Sine and Cosine:**

$$y = A\sin(B(x - x_0)) + D \qquad y = A\cos(B(x - x_0)) + D$$

Key features: Amplitude, Vertical reflection, Period, quarter points, Midline, Max Value, Min Value

Amp = $|A|$

Period = $T = \dfrac{2\pi}{B}$

Vertical Shift: Midline is shifted to $y = D$

Phase Shift: Starting Point is shifted to $x = x_0$

Note: If the function is in the form $y = A\sin(Bx + C) + D$, you can find the phase shift by factoring out the factor of B in the argument.

Example, page 692 #17: Find the phase shift for $y = \sin(\frac{\pi}{6}x + \pi) - 3$

Solution: $x_0 = -6$, To find this, factor out $\frac{\pi}{6}$ in the argument:

$$\tfrac{\pi}{6}x + \pi = \tfrac{\pi}{6}\left(x + \underline{\qquad}\right) = \tfrac{\pi}{6}\left(x + 6\right),$$

Where did that 6 come from? Either guess-and-check, or by dividing π by $\frac{\pi}{6}$, i.e., $\dfrac{\pi}{\frac{\pi}{6}} = \pi \cdot \frac{6}{\pi} = 6$

You can also set the argument equal to zero and solve for x. The resulting value will be the phase shift.

Applications: We can **find the equation** of the sine or cosine function, using a given graph or an application problem. Remember to always GRAPH the information first, then find the amplitude, period, phase shift, midline and vertical shift from the graph, then put that together into the appropriate function.

Section 8.2: The other trig functions (Secant, Cosecant, Tangent, Cotangent)

Vertical Asymptotes: Know that Vertical Asymptotes are created by Division by Zero!
(Note: In Precalculus, you will learn about holes, another feature in a graph that can be created by division by zero.)

Secant, Cosecant: These graphs are built from the cosine and sine graphs. The vertical asymptotes are found at the zeros of the cosine function (for secant) and the sine function (for cosecant).

Key features: Vertical Asymptotes, Shape $\bigcup\bigcap$, Max Value, Min Value, Basic Period $= 2\pi$

Know the Domain and Range of these functions

Tangent: These graphs are distinctly different from the others, but still have the feature of vertical asymptotes.

Key features: Vertical Asymptotes, passes through origin, "wiggle" at center, Basic Period $= \pi$

Know the Domain and Range of both Tangent and Cotangent Functions

Even and Odd Functions

Definition: Even functions $f(-x) = f(x)$ Odd functions: $f(-x) = f(x)$

Graphical View: Even functions: Symmetry w.r.t. the y-axis

Odd functions: Symmetry w.r.t. the origin.

Even Trig functions: $\cos x$, $\sec x$

Odd Trig functions: $\sin x$, $\csc x$, $\tan x$, $\cot x$

Section 8.3: Inverses and Inverse Trig Functions

- Know that inverse functions switch x and y, including the domain, range, and the x-axis and y-axis. When graphing an inverse, we reflect the graph of the original function across the line y = x.
  - Example: Graph y = sin(x) then graph the inverse by showing the sine graph oscillating on the y-axis (see notes on this)
  - Restricted Range: Why is the range restricted for the inverse trig functions? (Examine the inverse graph from above and note that it is not the graph of a function. Know Vertical Line Test.
- Even/Odd: Even Inverse Trig functions: NONE! $\cos^{-1} x$ is NOT even!
  Important Odd Trig functions: $\sin^{-1} x$, $\tan^{-1} x$
- Evaluate inverses.
  - For positive values, the inverse will give you an acute angle.
  - For negative values, you have to use the range restriction to find the angle in the appropriate quadrant. Know the range constraints for negative input values.
- Applications: Find angles using inverses. Express the answer in both radians and degrees.