Precalculus Students,

The Final Exam will be Thursday and Friday My 7/8. You will take it on-line using MyMathLab. You must complete it in one session in which you will have a total of two hours. To be prepared, you should have done or should do the following:

1. Watched all the videos on All Chapters. I am sure you have watched most of them, but you might want to relook at any on which you might need to sharpen your understanding. http://telstarbob.net/bbrown/math1113dailyspring2020-Revised.htm
2. Completed all the homework for the semester. Go back and improve your scores.
3. Work the Practice Final Exam by yourself. http://telstarbob.net/bbrown/Precalculus/FinalReviewProblemsPages.pdf
4. Watch Practice Final Exam video if you need help on any problem. https://youtu.be/HWA9x7uTuhQ
5. Go over all your tests and understand how to work any problems you missed, Ask me for any help you need.

Chapter 5

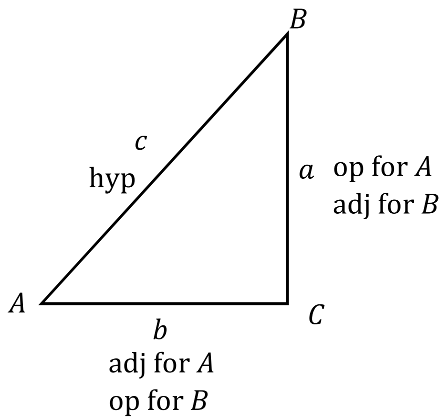
6. Understand the form and characteristics of polynomial functions
   $f(x) = a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{b-2} + \cdots + a_2x^2 + a_1x^1 + a_0$
   (real coefficients and non-negative integer exponents)
7. Calculate real (x intercepts) and complex zeros of polynomial functions. Use calculator to quickly find the real zeros and then long division to determine the complex zeros.
8. Use long division and find the Remainder if any (R=0 if divisor is a factor).
9. Find the vertical, horizontal, and oblique asymptotes, if any, for a given rational function.
10. Graph polynomial and rational functions.
11. Find the x and y intercepts of functions.

Chapter 7

12. Understand angles in degrees or radians
13. Understand degrees, minutes, seconds
14. Be able to convert angle in degrees, minutes, seconds to an angle in degrees in decimal form.
    $D\ M'S" = D + \frac{M}{60} + \frac{S}{3600}$
15. Calculate arc length s, radius r, or angle θ using $s = r\theta$, $\boldsymbol{\theta}$ ***must be in radians***!
16. Calculate arc area A, radius r, or angle θ using $A = \frac{1}{2}r^2\theta$, $\boldsymbol{\theta}$ ***must be in radians***!
17. Be able to convert radians to degrees and degrees to radians.
    $A\ radians\ to\ degrees: A\ \cancel{radians} \times \frac{180\ degrees}{\pi\ \cancel{radians}} = \frac{A(180)}{\pi}$ degrees

    $B\ degrees\ to\ radians: B\ \cancel{degrees} \times \frac{\pi\ radians}{180\ \cancel{degrees}} = \frac{\pi B}{180\pi}$ radians

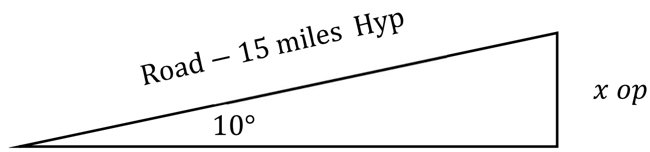
18. Solve right triangle problems given a, b, c, A, B, C and calculate trig functions. Always label the triangle to keep sides and angles correctly associated. **<u>Do not start a problem without drawing a good accurate sketch!</u>**.



19. Understand SOHCAHTOA and never forget $c^2 = a^2 + b^2$ $for\ a\ right\ triangle\ where\ c\ is\ hyp$
20. 180 degrees in any triangle. $A + B + C = 180°$, accute angles A & B sum to $90°$
21. For a point (x, y) on the unit circle: $x^2 + y^2 = 1$
    $\sin\theta = y, \cos\theta = x, and \tan\theta = \frac{y}{x}$ $\quad \csc\theta = \frac{1}{y}, \sec\theta = \frac{1}{x} and \cot\theta = \frac{x}{y}$
22. For a point (x, y) on a circle with radius r, $x^2 + y^2 = r^2$, $r = \sqrt{x^2 + y^2}$
    $\sin\theta = \frac{y}{r}, \cos\theta = \frac{x}{r}, and \tan\theta = \frac{y}{x}$ $\quad \csc\theta = \frac{r}{y}, \sec\theta = \frac{r}{x} and \cot\theta = \frac{x}{y}$
23. Note: $\csc\theta = \frac{1}{\sin\theta}$, $\sec\theta = \frac{1}{\cos\theta}$ $and\ \cot\theta = \frac{1}{tan\theta}$
24. Be able to substitute variables and given constants into a trig function and perform required calculation.
25. Understand that a periodic function $f(x)$ with period T repeats itself
    $f(x) = f(x \pm T) = f(x \pm 2T) = f(x \pm nT)$, where n is an integer
26. Use a calculator to calculate trig functions making sure that you have the **<u>calculator in the correct mode (radians or degrees).</u>**
27. Be able to graph trig functions such as $A\sin\omega x + B\ and\ A\cos\omega x + B$
    Amplitude = $|A|$**,** always positive, Period $T = \frac{2\pi}{|\omega|}$ always positive
28. Understanding the amplitude and period of a sinusoidal function can provide clues on what the graph should look like.
29. When calculating the phase shift of a function $f(kx + B)$, rewrite as $f[k\left(x + \frac{B}{k}\right)]$
    The phase shift will be $\frac{B}{k}$, shifted to the left if positive, and shifted to the right if negative.

30. Solve a right triangle application problem using the appropriate trig function. Draw a picture, label the picture (known/unknown), and decide on a trig function to use that will use your unknown and known values. Solve for the unknown.

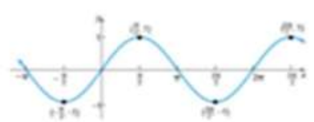
Example: A 15 mile road up a mountain is inclined 10 degrees. Calculate the total rise in elevation at the end of the road.



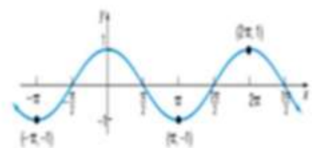
$\frac{x}{15} = \frac{\sin 10°}{1}$, $x = 15 \sin 10°$ = 2.60 miles

31. Be able to establish additional trig identities using the trig identities at the end of this guide. To do this you will need to remember how to use algebraic rules about manipulating fractional expressions.
    For example $\frac{a}{b} + \frac{c}{d} = \frac{ad+}{bd}$, and $\frac{a}{b} - \frac{c}{d} = \frac{ad-bc}{bd}$
32. Be able to manipulate trig identities and use them in solutions to trig equations. Be able to factor trig equations like $2cos^2\theta + cos\ \theta - 1$ = 0 and solve them for θ.
33. Solve Trig Equations Using Unit Circle – Easiest if you understand unit circle and the solution(s) lie(s) on the unit circle.
34. Solve Trig Equations Using Your Calculator - This is the only way if the solution(s) are not angles readable on the unit circle. **<u>Must have calculator in the correct mode (angles or radians).</u>**
35. Understand that sin θ and cos θ are always <= 1 and >= -1. The absolute value (magnitude) is between 0 and 1. Because csc θ = 1/sin θ and sec θ = 1/cos θ, csc θ and sec, must always be between 1 and + ∞ and – ∞ and -1. Graphs below illustrate this.

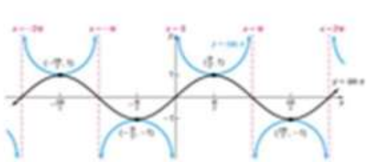
sin θ



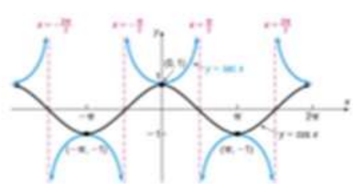
cos θ



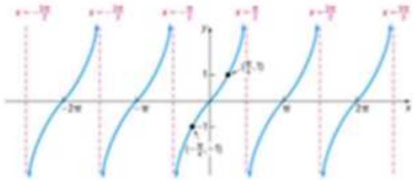
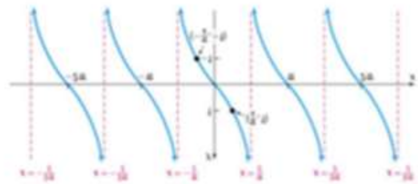
csc θ



sec θ



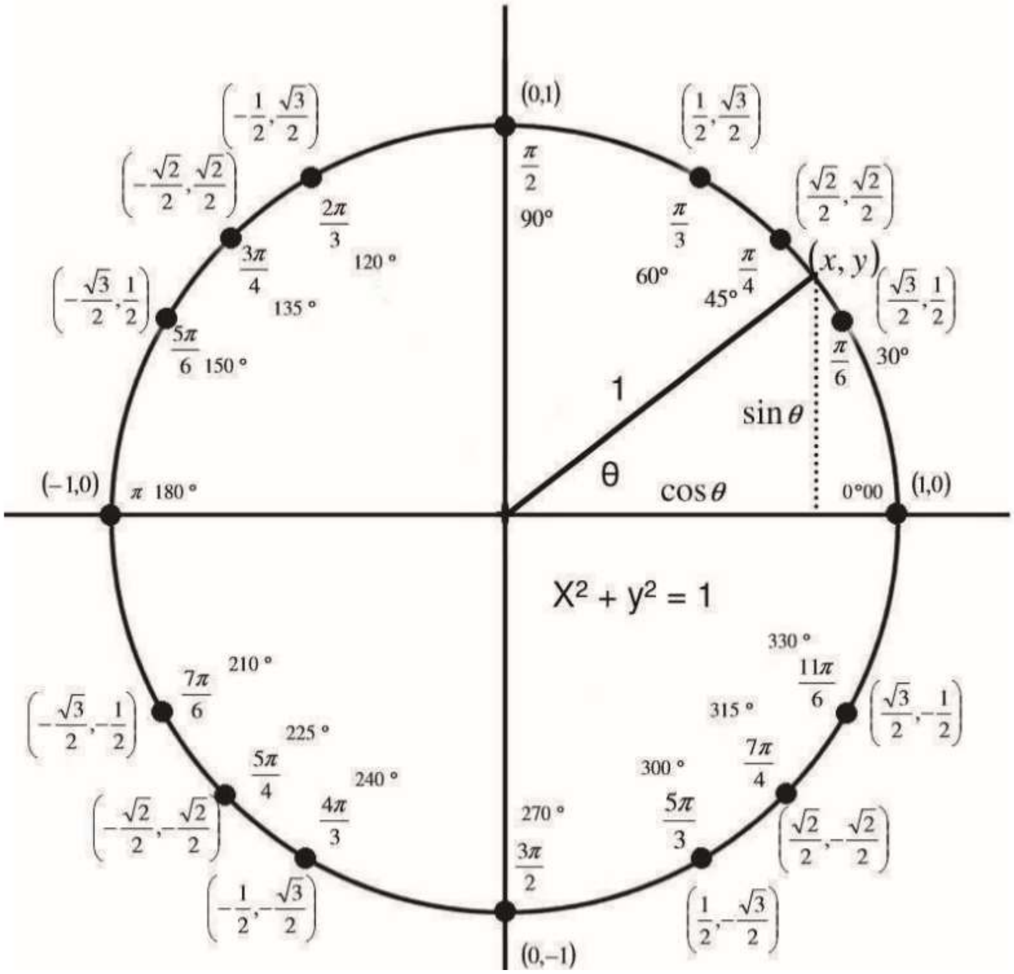
36. Also understand that the value of tan θ and cot θ is between -∞ and +∞. Graphs below illustrate this concept.

37. Find inverse function f^{-1} of trig function f.
38. Establish trig identities. You can use the identities listed in this guide.
39. Be careful in solving $x^2 = k$ $(k\ is\ positive)$. $x = \pm\sqrt{k}$. Do not miss half the problem because you forgot this.
40. Solve a number of triangle problems in which there are no right angles. It is absolutely imperative that you start with an accurately labeled diagram with all angles and sides info that you are given. You will use Law of Sines and Law of Cosines depending on the problem
41. Use Law of Sines to solve one/two triangle problems in which you determine whether there is one triangle solution or no triangle solution. Remember that after solving for an angle say B_1, determine whether there is another solution B_2, whose sine is the same. That would be 180-B_1. Then, if B2 + the other given angle is less than 180 degrees, there are two solutions. You complete the problem by using Law of Sines to solve for the other side.
42. Solve triangle problems using Law of Cosines. Here, if you have two sides and the angle between them, you can solve for the other side. Also, if you have all sides, you can solve for all angles using the alternate version of the Law of Cosines.
43. Find the area of a triangle. If you have two sides and the included angle θ, the area is ½ the product of the two sides times sin θ. If you have all three sides, use Heron's formula.
44. Solve word problems involving triangles. Draw an accurate picture.

All of these ideas are illustrated in the various practice tests and the practice final.

On the test, you may have this study guide as well as the unit circle and associated formulas at the end of this note.



Some Identities You May Need

Reciprocal Identities

$$\sin x = \frac{1}{\csc x} \qquad \sec x = \frac{1}{\cos x} \qquad \tan x = \frac{1}{\cot x}$$

$$\csc x = \frac{1}{\sin x} \qquad \cos x = \frac{1}{\sec x} \qquad \cot x = \frac{1}{\tan x}$$

Tangent and Cotangent Identities

$$\tan x = \frac{\sin x}{\cos x} \qquad \cot x = \frac{\cos x}{\sin x}$$

Pythagorean Identities

$$\sin^2 x + \cos^2 x = 1$$

$$1 + \tan^2 x = \sec^2 x \qquad 1 + \cot^2 x = \csc^2 x$$

$$s = r\theta$$

$$A = \frac{1}{2}r^2\theta$$

Remember SOHCAHTOA

$$T = \frac{2\pi}{\omega}$$

$$\frac{\sin A}{a} = \frac{\sin B}{b} \qquad \frac{\sin A}{a} = \frac{\sin C}{c} \qquad \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Sines

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Law of Cosines

$$\cos C = \frac{a^2 + b^2 - c^2}{2ab}$$

Law of Cosines – Alternate Version

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac}$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

The Area K of a Triangle is One Half the product of two sides times the sine of the angle between them

$$K = \frac{1}{2}ab\sin C$$

$$K = \frac{1}{2}bc\sin A$$

$$K = \frac{1}{2}ac\sin B$$

Heron's Formula

The area K of a triangle with sides a, b, and c is

$$\boxed{K = \sqrt{s(s-a)(s-b)(s-c)} \qquad \textbf{(5)}}$$

where $s = \frac{1}{2}(a + b + c)$.