Final Exam Preparation

The final exam will be about 10 questions long, some with two parts.

Things to guide your preparation:

- Start with the final exam review questions to get an overview of the material.
  Attempt the questions before reading my solution, if you get stuck, read only as much of the solution as you need to get unstuck, and then try to finish the problem. Refer to the text as necessary.
  This will provide you with an overview of the material you need to be studying.
- Then review Practice Problems and previous tests.
- Then review the concepts described in the concept reviews for each test on the course webpage.
  Can you talk about the concepts? Do you know the basic results from the concept review? For example, do you know the logarithm and exponential laws? What is the algebraic way of checking if a function is odd or even? Ask yourself these questions, and make sure you can answer them.
- Make notes on the topics you are studying.
  Write short sentences to describe how to solve problems. Include example problems if a certain type of problem appears frequently.
- Then do problems from the text for which you have solutions, that are similar to the problems you have seen so far in your test preparation.
- Branch out and do other types of problems that appeared less frequently throughout the course.
- Studying in many short sessions is more effective than one or two marathon studying sessions.
  Consider making a time schedule which maps out when and what you will study, to help you organize and prepare for <u>all</u> your finals.
  You might choose a long term time frame (Friday Morning: History, Friday Afternoon: Precalculus, etc), and a short term time frame for each day that lists what exactly you will focus on. The short term time frame can be created every day and be more flexible.
  Create goals which you can reasonably be expected to meet.
- Get as much sleep as possible while you study for finals. Come to your final exams well rested, and mentally sharp.
- Study in an environment that mimics the environment the test will take place in. It should be quiet and clear of clutter.

Once you have begun your review, here are some things you might do.

- For a given chapter (or section), create practice "tests" for yourself, maybe three or four questions which you have the solution to, and then answer them without reference to the text. Correct your test, or have a friend correct your test and you correct theirs. Do not move on to other questions until you have mastered these ones. You might consider imposing a time limit on these mini-tests.
- If you do study in groups, also study alone so you can focus on the types of questions you need to work on.
- Before the final, practice some mini-tests which draw from all the chapters we have studied.
- Talk with me if there are questions you have.

Concept Review. Material for the final can be drawn from anything we have studied. I would suggest focussing on the following, before branching out to master the rest. The numbers are the sections from the text.

1.2 Functions and their Properties: function definition and notation, domain and range, continuity, increasing/decreasing, boundness, extrema, asymptotes, end behaviour, odd/even/neither

1.4 Building Functions from Functions: algebraic combinations, compositions, implicit functions

1.5 Parametric Relations and Inverses: parametric relations, inverse functions

1.6 Graphical Transformations: vertical and horizontal translations, reflections across axes

2.1 Linear and Quadratic Functions and Modeling: polynomial functions, linear functions and their graphs, quadratic functions and their graphs (vertex & axis), completing the square

2.2 Power Functions with Modeling: power functions, direct and inverse variation, graphs of power functions

2.3 Polynomial Functions of Higher Degree with Modeling: polynomial functions in general, end behaviour

2.6 Graphs of Rational Functions:

2.7 Solving Equations in One Variable: solving rational equations

2.8 Solving Inequalities in One Variable: sign charts, solving polynomial inequalities, solving rational inequalities, solving radical inequalities, solving absolute value inequalities

3.1 Exponential and Logistic Functions: exponential and logistic functions and their graphs, the base e

3.3 Logarithmic Functions and Their Graphs: logarithm as inverse function to exponential, properties of logarithms, natural logarithm (base e), graphs of logarithms

3.4 Properties of Logarithmic Functions: logarithms laws (properties of logarithms), change of base

3.5 Equation Solving and Modeling: solving equations using logarithms and exponentials, extraneous solutions

4.1 Angles and Their Measures: degrees and radians, circular arc length

4.2 Trigonometric Functions of Acute Angles: right triangle trig (SOH CAH TOA), 30-60-90 triangle, 45-45-90 triangle

4.3 Trigonometry Extended: The Circular Functions: rotations beyond acute angles, quadrants, nomenclature, unit circle, periodicity

4.4 Graphs of Sine and Cosine: Sinusoids: cosine, sine, period, amplitude, frequency

4.5 Graphs of Tangent, Cotangent, Secant, and Cosecant: tangent, cotangent, secant, cosecant, solving equations algebraically

4.7 Inverse Trigonometric Functions: inverse sine, inverse cosine, inverse tangent, restricted domains, compositions

5.1 Fundamental Identities: basic trig identities, Pythagorean identities, cofunction identities, odd-even identities, simplifying, solving trig identities

5.2 Proving Trigonometric Identities: proof strategies, disproving nonidentities

5.3 Sum and Difference Identities: cosine, sine, and tangent of a sum or difference

5.4 Multiple-Angle Identities: double angle identities, half angle identities, power reducing identities, solving trig equations

6.4 Polar Coordinates: polar coordinate system, nomenclature, coordinate conversion, equation conversion

7.1 Solving Systems of Two Equations: method of substitution, graphical solutions, method of elimination

Sketching Circles, Ellipses, Hyperbolas: sketching only–this material is in Section 8.1, 8.2, 8.3 of the text, but the text contains a lot more information than we looked at!

Example Solve the system of equations algebraically

$$\frac{y^2}{4} + \frac{x^2}{9} = 1 \quad (1)$$
$$x^2 + y^2 = 4 \quad (2)$$

Draw a well labelled sketch of the situation.

Rewrite Eq. (2) as $y^2 = 4 - x^2$ and substitute into Eq. (1):

$$\begin{aligned} \frac{y^2}{4} + \frac{x^2}{9} &= 1 \\ 9y^2 + 4x^2 &= 36 \\ 9(4 - x^2) + 4x^2 &= 36 \\ 36 - 9x^2 + 4x^2 - 36 &= 0 \\ 13x^2 &= 0 \\ x &= 0 \end{aligned}$$

For $x = 0$:

$$y = \pm\sqrt{4 - x^2} = \pm\sqrt{4 - 0} = \pm 2$$

The solutions are $(x, y) = (0, 2)$ and $(x, y) = (0, -2)$.

Here is a sketch. This sketch can be drawn by hand, without the aid of a calculator. We see there are two points of intersection of the curves. The red curve is the ellipse from Eq. (1), and the blue curve is the circle from Eq. (2). Make sure you can sketch these by hand!