MATH 29—OUTLINE FOR THE FINAL EXAM

Sections covered: 1.1–1.8, 2.1–2.6, 3.1–3.6, 4.1–4.5, 5.1–5.5

Main ideas

A. Functions and relations: domain, range, intercepts, asymptotes

B. Transforming functions: translating, reflecting, shrinking/stretching

C. Combining functions: addition, subtraction, multiplication, division, composition

D. Inverse functions

E. Families of functions: Linear, quadratic, polynomial, rational, exponential, logarithmic, trigonometric, and inverse trigonometric functions

F. Piecewise defined functions

G. Measuring angles

H. Trigonometric identities

I. Solving polynomial, exponential, logarithmic, and trigonometric equations

J. Solving polynomial inequalities

K. Modeling and word problems with exponential functions and trig. functions

Skills you should have

1. Be able to determine domain, range, x-intercepts (zeros), and asymptotes of various functions

- Functions may involve rational functions, roots, exponentials, logs, and trig. functions
- Know how to find the vertical asymptotes for rational functions, logarithmic functions, and $\tan x$
  - Know the difference between a vertical asymptote and a hole
- Know how to find the horizontal asymptotes for rational functions and exponential functions

2. Be able to graph functions using graph transformations: vertical and horizontal translations, reflections, stretches (and shrinks)

- **<u>Memorize</u>** the graphs of $x, x^2, x^3, |x|, \sqrt{x}, e^x, \ln x, \sin x, \cos x, \tan x$
- Be able to graph a complex equation by applying transformations to a basic graph
- Be able write an equation for a graph by transforming the equation for a basic graph
- For trig. functions, try to determine the period first: period of $\sin(Bx)$ and $\cos(Bx)$ is $\frac{2\pi}{B}$

3. Be able to combine functions algebraically to get new functions: focus on composition of functions.

4. Be able to find the inverse of a function, if it exists

- Be able to find the inverse of a function graphically (by reflecting over the line $y = x$)
- Be able to find the inverse of a function algebraically (by solving for x in terms of y and then swapping the variables)
- Be able to compute values for $f^{-1}(x)$ given values for $f(x)$

5. Be able to work with and graph piecewise defined functions.

6. Be able to write equations for lines.

- Be able to write an equation for a line given the slope and a point on the line.
- Be able to write an equation for a line given other information, such as two points on the line.
- Given a line L, be able to find the slope of a line parallel or perpendicular to L.

7. Be able to graph angles and determine the measure of angles

8. Be able to precisely compute the trig. functions for different angles

- Know how to compute the trig. functions using the unit circle. **I will provide a unit circle**
- Know how to compute the trig. functions from a right triangle

9. Be able to work with the various trig. identities

- **Memorize** the following identities:
  - $\sin^2 x + \cos^2 x = 1$
  - $\csc x = \dfrac{1}{\sin x}$; $\sec x = \dfrac{1}{\cos x}$; $\tan x = \dfrac{\sin x}{\cos x}$; $\cot x = \dfrac{\cos x}{\sin x}$
  - $\sin(u + v) = \sin u \cos v + \cos u \sin v$
  - $\cos(u + v) = \cos u \cos v - \sin u \sin v$
- Be able to use trig. identities to prove new ones or to simplify expressions

10. Be able to solve equations

- Equations may involve exponents, logarithms, and trig. functions
- Techniques include: factoring, taking a log of both sides, exponentiating both sides, using the unit circle to find particular solutions
- For equations involving trig. functions, be able to find *all* solutions

11. Be able to solve polynomial inequalities

12. Be able to build models for growth and decay word problems using exponential functions

- Focus on population growth, radioactive decay, and money that gains interest
- Be able to analyze the model to answer follow-up questions

13. Be able to solve word problems using triangles and trigonometry

14. Some bigger topics that **will not be on the exam**

- The Rational Zeros Theorem to help find zeros of a polynomial
- Polynomial long division

How to study

    I. Review core topics.

   II. <u>**Work lots of problems all of the way through.**</u> Focus on ALEKS problems, problems from class, and problems from previous exams

- I made homework assignments in ALEKS that are *worth no credit* for you to review. They are titled "Review for Section XXX (no credit)"
- Rework the previous exams
- You can also redo worksheets from class—they are posted on the course website (link is in Canvas)

 III. Practice doing several problems in a short amount of time.

 IV. Come talk with me if you have any questions!