Course website: The syllabus for this course and assignments will be available through the course website which is located at

`http://www.math.uky.edu/~ma113/s.14/`

This handout only covers a few of the most important items from the syllabus. Please visit the course website and read through the complete syllabus. Information that applies to all sections will appear at the course website. Your instructor may have additional policies that apply to your section.

Textbook: The textbook for this course will be *Calculus, Early Transcendentals*, 2nd edition by J. Rogawski. The full text will likely be used for three semesters of Calculus at UK, MA 113, MA 114 and MA 213. A single-variable text is available that includes the material for MA 113 and MA 114. Both texts are available with optional access to an online version of the book. A paper back edition is custom published for UK, but you may also use the standard version of the textbook.

Grading: Your grade in MA 113 will be based on four exams, web homework, six written assignments and attendance in lecture. Your grade in MA 193 will be based on attendance in recitation and your grade in MA 113.

Exam dates: There will be four exams for this course given at the following dates and times. Please make every effort to attend each exam.

Exam 1	5-7 pm, Tuesday, 11 February 2014
Exam 2	5-7 pm, Tuesday, 11 March 2014
Exam 3	5-7 pm, Tuesday, 15 April 2014
Exam 4	8:30-10:30 pm, Wednesday, 7 May 2014

Web Homework: This course will use web homework on the system WeBWorK at

`http://courses1.webwork.maa.org/webwork2/uky-ma113/`

Your username to log in will be your link blue id with all letters upper case, for example `CRONA222`, and your password will be your eight digit student id number. For most students, this number begins with a 1, for example `12345678`. Do not include the initial 9. Students who add after the start of the semester may write *russell.brown@uky.edu* to request an account.

Recitation worksheets: In each recitation you will work on a problems with fellow students. The first three worksheets are attached to this document. The full packet is available at the course website and beginning with the fourth recitation, students are expected to bring the day's worksheet to recitation.

Academic honesty: Students are encouraged to work together on web homework and written assignments to understand a problem and to develop a solution. However, the final product must be your own work. Copying during examinations is not allowed. Cheating or plagiarism is a serious offense. For more details on the University policy on academic dishonesty, please visit
`http://www.uky.edu/Ombud/ForStudents_AcademicIntegrity.php`.

January 12, 2014

Worksheet # 1: Functions and inverse functions

1. Give the domain and ranges of the following functions.

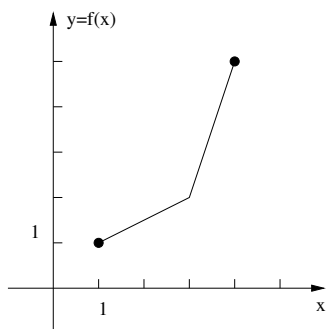
   (a) $f(x) = \frac{x+1}{x^2+x-2}$

   (b) $g(t) = \frac{1}{\sqrt{t^2-1}}$

2. If $f(x) = 5x+7$ and $g(x) = x^2$, find $f \circ g$ and $g \circ f$. Are the functions $f \circ g$ and $g \circ f$ the same function?

3. Let $f(x) = 2 + \frac{1}{x+3}$. Determine the inverse function of f, f^{-1}. Give the domain and range of f and the inverse function f^{-1}. Verify that $f \circ f^{-1}(x) = x$.

4. Consider the function whose graph appears below.



   (a) Find $f(3)$, $f^{-1}(2)$ and $f^{-1}(f(2))$.

   (b) Give the domain and range of f and of f^{-1}.

   (c) Sketch the graph of f^{-1}.

5. Let $f(x) = x^2 + 2x + 5$. Find the largest value of a so that f is one to one on the interval $(-\infty, a]$. Let g be the function f with the domain $(-\infty, a]$. Find the inverse function g^{-1}. Give the domain and range of g^{-1}.

6. True or False:

   (a) Every function has an inverse.

   (b) If $f \circ g(x) = x$ for all x in the domain of g, then f is the inverse of g.

   (c) If $f \circ g(x) = x$ for all x in the domain of g and $g \circ f(x) = x$ for all x in the domain of f, then f is the inverse of g.

   (d) If $f(x) = 1/(x+2)^3$ and g is the inverse function of f, then $g(x) = (x+2)^3$.

   (e) The function $f(x) = \sin(x)$ is one to one.

   (f) The function $f(x) = 1/(x+2)^3$ is one to one.

7. Find the slope, x-intercept, and y-intercept of the line $3x - 2y = 4$.

8. Let f be a linear function with slope m with $m \neq 0$. What is the slope of the inverse function f^{-1}.

9. A ball is thrown in the air from ground level. The height of the ball in meters at time t seconds is given by the function $h(t) = -4.9t^2 + 30t$. At what time does the ball hit the ground (be sure to use the proper units)?

10. We form a box by removing squares of side length x centimeters from the four corners of a rectangle of width 100 cm and length 150 cm and then folding up the flaps between the squares that were removed. a) Write a function which gives the volume of the box as a function of x. b) Give the domain for this function.

Worksheet # 2: Review of Trigonometry

1. Convert the angle $\pi/12$ to degrees and the angle $900°$ to radians. Give exact answers.

2. Suppose that $\sin(\theta) = 5/13$ and $\cos(\theta) = -12/13$. Find the values of $\tan(\theta)$, $\cot(\theta)$, $\csc(\theta)$, and $\sec(\theta)$.

   Find the value of $\tan(2\theta)$.

3. If $\pi/2 \leq \theta \leq 3\pi/2$ and $\tan\theta = 4/3$, find $\sin\theta$, $\cos\theta$, $\cot\theta$, $\sec\theta$, and $\csc\theta$.

4. Find all solutions of the equations a) $\sin(x) = -\sqrt{3}/2$, b) $\tan(x) = 1$.

5. A ladder that is 6 meters long leans against a wall so that the bottom of the ladder is 2 meters from the base of the wall. Make a sketch illustrating the given information and answer the following questions.

   How high on the wall is the top of the ladder located? What angle does the top of the ladder form with the wall?

6. Let O be the center of a circle whose circumference is 48 centimeters. Let P and Q be two points on the circle that are endpoints of an arc that is 6 centimeters long. Find the angle between the segments OQ and OP. Express your answer in radians.

   Find the distance between P and Q.

7. The center of a clock is located at the origin so that 12 lies on the positive y-axis and the 3 lies on the positive x-axis. The minute hand is 10 units long and the hour hand is 7 units. Find the coordinates of the tips of the minute hand and hour hand at 9:50 am on Newton's birthday.

8. Find all solutions to the following equations in the interval $[0, 2\pi]$. You will need to use some trigonometric identities.

   (a) $\sqrt{3}\cos(x) + 2\tan(x)\cos^2(x) = 0$
   (b) $3\cot^2(x) = 1$
   (c) $2\cos(x) + \sin(2x) = 0$

9. A function is said to be periodic with period T if $f(x) = f(x+T)$ for any x. Find the smallest, positive period of the following trigonometric functions. Assume that ω is positive.

   (a) $|\sin t|$
   (b) $\sin(3t)$.
   (c) $\sin(\omega t) + \cos(\omega t)$.
   (d) $\tan^2(\omega t)$.

10. Find a quadratic function $p(x)$ so that the graph p has x-intercepts at $x = 2$ and $x = 5$ and the y-intercept is $y = -2$.

11. Find the exact values of the following expressions. Do not use a calculator.

    (a) $\tan^{-1}(1)$
    (b) $\tan(\tan^{-1}(10))$
    (c) $\sin^{-1}(\sin(7\pi/3))$
    (d) $\tan(\sin^{-1}(0.8))$

12. Give a simple expression for $\sin(\cos^{-1}(x))$.

13. Let f be the function with domain $[\pi/2, 3\pi/2]$ with $f(x) = \sin(x)$ for x in $[\pi/2, 3\pi/2]$. Since f is one to one, we may let g be the inverse function of f. Give the domain and range of g. Find $g(1/2)$.

Worksheet # 3: The Exponential Function and the Logarithm

1. (a) Graph the functions $f(x) = 2^x$ and $g(x) = 2^{-x}$ and give the domains and range of each function.
   (b) Determine if each function is one-to-one. Determine if each function is increasing or decreasing.
   (c) Graph the inverse function to f. Give the domain and range of the inverse function.

2. (a) Solve $10^{2x+1} = 100$.
   (b) Solve $2^{(x^2)} = 16$.
   (c) Solve $2^x = 4^{x+2}$.
   (d) Find $\log_2(8)$.
   (e) Find $\ln(e^2)$.
   (f) Solve $e^{3x} = 3$.
   (g) Solve $4^x = e$.
   (h) Solve $\ln(x+1) + \ln(x-1) = \ln(3)$. Be sure to check your answer.

3. Evaluate the expressions $4^{(3^2)}$ and $(4^3)^2$. Are they equal?

4. Suppose a and b are positive real numbers and $\ln(ab) = 3$ and $\ln(ab^2) = 5$. Find $\ln(a)$, $\ln(b)$, and $\ln(a^3/\sqrt{b})$.

5. Consider the function $f(x) = 1 + \ln(x)$. Determine the inverse function of f. Give the domain and range of f and of the inverse function f^{-1}.

6. Suppose that a population doubles every two hours. If we have one hundred critters at 12 noon, how many will there be after 1 hour? after 2 hours? How many were there at 11am? Give a formula for the number of critters at t hours after 12 noon.

7. Let f be the function $f(x) = 4^x$. Write the function f in the form $f(x) = e^{kx}$.

8. Let f be the function $f(x) = 5 \cdot 3^x$. Write the function in the form Ae^{kx}.

9. Suppose that f is a function of the form $f(x) = Ae^{kx}$. If $f(2) = 20$ and $f(5) = 10$, will we have $k > 0$ or $k < 0$? Find A and k so that $f(2) = 20$ and $f(5) = 10$.

10. Let f be the function given by $f(x) = \tan(x)$ with x in the interval $(\pi/2, 3\pi/2)$. Find $f^{-1}(0)$ and $f^{-1}(\sqrt{3})$.

    Sketch the graphs of f and f^{-1}. Give a formula which expresses f^{-1} in terms of the function $\tan^{-1}$ (or arctan).