Mth 30, Homework 2 on sections 1.4, 1.5, 1.6

Due by Wed, Feb 19.

Write all your working out and answers by hand on your own notepaper and hand them to me next week. Please use lots of space and as many pages as you want, so I can include corrections or comments - otherwise I may deduct points or ask you to redo it. It must be your own note paper, not a printout of this. You do not need to write the questions, but it is very important that you show clearly any work you had to do to get your answers. Questions are worth 3 points each.

Section 1.4 Composition of Functions

(1) For the functions $f(x) = x^2 - 4$, $g(x) = 3x + 2$, compute and simplify formulas for the new functions:

- **(a)** $(f + g)(x)$
- **(b)** $(f - g)(x)$
- **(c)** $(fg)(x)$

(Remember that $(f + g)(x)$ means the sum function $f(x) + g(x)$. Parts (b) and (c) are similar with difference and product.)

(2) For the same functions $f(x) = x^2 - 4$, $g(x) = 3x + 2$, find and simplify the composition functions

- **(a)** $(f \circ g)(x) = f(g(x))$
- **(b)** $(g \circ f)(x) = g(f(x))$

(Your first line for part (a) should start: $f(g(x)) = f(3x + 2) = (3x + 2)^2 - 4 = \cdots$)

(3) If $f(4) = 5$, $f(5) = 0$, $f(3) = 5$, $g(0) = 4$ and $g(5) = 3$ then find

$$g(f(5))$$

(4) For $f(x) = 3x^2 - x$, $g(x) = 4x - 1$, show that after expanding and simplifying,

$$f(g(x)) = 48x^2 - 28x + 4$$

(5) Let $f(x) = \sqrt{x}$ and $g(x) = 6x - 4$. Compute

- **(a)** $f(g(x))$
- **(b)** $g(f(x))$

Section 1.5 Transformation of Functions

(6) Starting with the graph of $f(x)$, how far and in which direction must you move it to get the graph of $f(x+20)$?

(7) **(a)** Sketch the graph of the square root function $y = \sqrt{x}$. Make a neat and careful picture - label and mark off numbers on the x and y axes.

(b) On the same picture draw the graph of $2 + \sqrt{x-3}$

(c) On the same picture draw the graph of $-\sqrt{x}$?

(Remember the transformations we looked at in this section such as moving left, right, up, down and reflecting.)

(8) A function $f(x)$ is called **even** if $f(-x) = f(x)$ and its graph looks the same on each side of the y-axis. A function is called **odd** if $f(-x) = -f(x)$ and its graph is symmetric through the origin.

(a) Decide if $f(x) = 2x^3$ is even, odd or neither.

(b) Decide if $f(x) = 2x + 1$ is even, odd or neither.

(c) Decide if $f(x) = x^2 + 1$ is even, odd or neither.

(9) The function $y = |x|$ has a V-shaped graph. Give the formula for the function whose graph has an upside down V, with corner moved up 3 units.

Section 1.6 Absolute Value Functions

(10) Solve the absolute value equality $|x+3| = 10$

(You should find two solutions. Check they do work.)

(11) Solve the inequality $|2x-5| < 7$ and give the answer in interval notation.

(Recommended method: solve the equality $|2x-5| = 7$ first, to get two numbers. Then decide if you need solutions between these numbers or on each side of them for the inequality.)

(12) Solve the inequality $|x+3| > 3$ and express the answer using interval notation.

(If the solutions have two parts, use the union notation $\cup$)

(13) Solve the inequality $|3x+6| + 1 \geqslant 4$ and give the answer in interval notation.

If you get stuck on a question or aren't sure if you understand it:

- Go over the relevant class notes and section in the textbook.
- Check if you get the right answer for a similar odd-numbered question in the textbook (answers at the back of the book).
- Ask me about it after class.
- Come to my office hours: Mon 2:00 - 3:00, Wed 2:00 - 3:00 in CP 317.
- Go to the Math Tutorial Lab in-person in CP 303 or online.