Math 141, Problem Set #2
(due **in class** Fri., 9/20/13)

Stewart, section 1.2, problems 18, 20, 26, 34, 38, 52, 54, 58, 60, 66. For problem 26, write $x^2 + 6x + 4$ as $(x+3)^2 - 5$ ("completing the square").
Stewart, section 1.3, problems 4, 8, 10, 22. Note that in this class, all trig functions are in radians. Make sure your calculator is in radians mode when you try 1.3.22! If you don't have a graphing calculator that does zooms, please say so in your solution, and I won't take off points for your not doing part (d) of the problem.

Also:

A. Let $f(x) = 1/(1-x)$. Graph the functions f, $f \circ f$, and $f \circ f \circ f$ (be careful about graphing the last of these!).

B. Stewart writes (see page 13) that the graph of the curve $y = ax^2+bx+c$ is obtained by shifting the graph of the curve $y = ax^2$. Be explicit about how the graph is to be shifted (left? right? up? down? how much?). Hint: Use the method of "completing the square" to rewrite ax^2+bx+c in the form $a(x-r)^2 + s$ for suitable constants r and s (depending on the constants a, b, c).

C. Show that there exists a polynomial $p()$ of degree 2 such that $p(3) = 1$, $p(5) = 0$, and $p(7) = 0$. You do *not* need to write it down explicitly in the form $p(x) = ax^2 + bx + c$; see if you can find a proof that does not require messy arithmetic. (Hint: $(x-5)(x-7)$ is a polynomial of degree 2 that has almost all of the properties that you seek. If this isn't enough of a hint, see problem 1.2.5 and its solution.)

D. In part C you showed that there is a polynomial $p()$ of degree 2 such that

$$p(3) = 1,\ p(5) = 0,\ p(7) = 0.$$

In the same way one can prove that there exist polynomials $q()$ and $r()$ of degree 2 such that

$$q(3) = 0,\ q(5) = 1,\ q(7) = 0$$

and

$$r(3) = 0,\ r(5) = 0,\ r(7) = 1.$$

(Do not compute $q()$ and $r()$; that's not what the problem is about.) Using $p()$, $q()$, and $r()$ as building blocks, construct a polynomial $s()$ of degree 2 such that

$$s(3) = 1,\ s(5) = 2,\ s(7) = 3.$$

Your answer should be of the form $s(x) = Ap(x) + Bq(x) + Cr(x)$ for appropriately chosen constants A, B, C. (Hint: If you spend more than half an hour on this, and aren't getting anywhere, look up Lagrange interpolation on the web.)

Please don't forget to write down on your assignment **who you worked on the assignment with** (if nobody, then write "I worked alone"), and write down on your time-sheet **how many minutes you spent on each problem** (this doesn't need to be exact).