Math 141, Problem Set #7
(due **in class** Fri., 11/1/13)

Note: To get full credit for a non-routine problem, it is not enough to give the right answer; you must explain your reasoning.

Stewart, section 2.4, problems 18, 34, 40, 44.

Stewart, section 2.5, problems 32, 58, 64, 78.

Stewart, section 2.6, problems 18, 20, 36, 42. (Hint for problems 36 and 42: It's easier if you choose the point first, and *then* choose the curves.)

Stewart, section 2.7, problems 4, 14, 20, 34.

Also:

A. Derive the Quotient Rule from the Product Rule, the basic Power Rule (the version on page 96, not the one on page 117!), and the Chain Rule. (Hint: $f(x)/g(x)$ can be written as $f(x)$ times $1/g(x)$, and $1/g(x)$ can be written as $h(g(x))$ where $h(x) = 1/x = x^{-1}$.) Do not use other rules in your derivation.

B. (a) Let $F(x) = |f(x)|$ where the function $f(x)$ is differentiable at a. Assume $f(a) \neq 0$. Show that $F(x)$ is differentiable at a, and express $F'(a)$ in terms of $f(a)$ and $f'(a)$. (Hint: You can do this with the Chain Rule.)

   (b) Show that the assumption $f(a) \neq 0$ cannot be dropped in part (a) by giving an example of a differentiable function $f(x)$ such that $f(a) = 0$ and the function $F(x) = |f(x)|$ is NOT differentiable at $x = a$.

   (c) Does there exist a differentiable function $f(x)$ such that $f(a) = 0$ and the function $F(x) = |f(x)|$ IS differentiable at $x = a$?

C. Sketch the curve $y^2 = x^2 - x^4$ using implicit differentiation to identify all horizontal and vertical tangent-lines. At what angle does the curve cross itself at the origin?

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).