Math 532: Homework 3
Due 9/18/19
Everyone turns in an individual copy.

1. From the textbook (2pts each), problems 1.12.1(c),1.12.1(e), 1.12.2
2. (5pts) 1.12.6
3. (3pts) 2.14.2
4. (3pts) 2.14.4
5. (5pts) For a level set of a function, $f(x, y) = c$, show that ∇f is orthogonal to the level set. Hint, the easiest way to see this is to treat the level curve as parametrized by parameter s so that

   $$f(x(s), y(s)) = c, \ s_i \leq s \leq s_f.$$

   A use of the chain rule and remembering how we define tangents to curves (say with the vector $\langle dx/ds, dy/ds \rangle$), takes care of the rest.
6. (5pts) Suppose we have two functions $f(x, y)$ and $g(x, y)$ such that

   $$f_x = g_y, \ f_y = -g_x.$$

   Show the level sets of f and g are orthogonal to one another.