MATH 420 Homework #2 — Due: 16 Sept 2015 (Weds)

1. Use the R code provided in class (on the website) to find the input values that maximize the following functions. Do this using two methods: First, find the values that maximize f *analytically* (i.e., using calculus) then do it *computationally* (e.g., using `optimize` or `optimx` in R). How well the computationally and analytically derived values agree?

   a. Let $a = 1$, $b = 2$, and $c = 0.5$. For $x > 0$, maximize

   $$f(x) = \frac{x}{a + b\,x + c\,x^2}$$

   b. Maximize f over all x, $y \in \mathbb{R}$, where

   $$f(x, y) = e^{-x^2 - 4y^2 + 4x - 4}$$

   c. Minimize f over all w, x, y, $z \in \mathbb{R}$, where

   $$\sqrt{17\,z^2 + \pi\,y^2 + \sqrt{2}\,x^2 + e\,w^2 + 1}$$

2. Use LaGrange Multipliers (see section 2.2) to maximize $x + y$ when x and y are constrained to the circle $x^2 + y^2 = 4$.

   Bonus: Use polar coordinates to solve #2 as an unconstrained optimization problem.