MTH 254 **HW #1** Spring 2015

1. Suppose the concentration ρ (in mg per liter) of a drug in the blood as a function of x, the amount (in mg) of the drug given, and t, the time (in hours) since the injection, is given by

$$\rho(x,t) = 1.1\, t\, e^{-0.9\, t(5-x)}$$

(a) Find $\rho(3,2)$. Give units, and interpret in terms of drug concentration.
Your answer should be a complete sentence, describing both inputs and outputs.

(b) Explain the significance of the following two single-variable functions in terms of drug concentration.

$$\rho(4,t) \qquad\qquad \rho(x,1)$$

(c) What values do you think x can take? What about t?

2. Choose a function $f(x,y)$.
You may choose a simple function, but you won't get brownie points for being too clever...

(a) Draw at least 4 level sets $\{f(x,y) = \text{constant}\}$.
Your level sets should be drawn on the same axes, and the spacing between them should be at least roughly correct. Label each level set with the corresponding value of f.

(b) Graph your function while holding x fixed to a particular value, such as $x = 0$. Then do the same for y held fixed.

(c) Graph your function, that is, graph $z = f(x,y)$.

Vocabulary: A (vertical) *trace* of a surface is the intersection of the surface with a (vertical) plane, such as $\{x = \text{constant}\}$ or $\{y = \text{constant}\}$. The trace parallel to the x-axis (thus with x changing and y held constant!) is often referred to as the *x-trace*.