1. Suppose the concentration $\rho$ (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

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

(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.

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

(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.