HOMEWORK 1
DIFFERENTIAL EQUATIONS
DUE 2013-08-22

Show your work!

(1) Alice, Bob, and Chuck are trying to find particular solutions of the differential equation

$$\frac{\mathrm{d}y}{\mathrm{d}t} = \frac{y+1}{t+1}.$$

Alice finds $y = t$, Bob finds $y = 2t + 1$, and Chuck finds $y = t^2 - 2$. Who is correct?

(2) (a) Find the solution of $\dfrac{\mathrm{d}y}{\mathrm{d}t} = t$ such that $y = 1$ when $t = 1$.

(b) Find the solution of $\dfrac{\mathrm{d}y}{\mathrm{d}t} = y$ such that $y = 1$ when $t = 1$.

(3) The differential equation $\dfrac{\mathrm{d}y}{\mathrm{d}t} = y + t$ has a solution of the form $y = mt + b$, where m and b are constants. What is that solution? (You *need not* find the general solution.)

(4) A population of field mice grows at a rate of 5% of its size per month. It also experiences predation from foxes, who eat 0.1% of the mice per day. Write a differential equation to model the population of mice.

- **One** book problem: #1.1.23.