

**Math 250a (Fall '07) - Homework 12 extra problems**

1. Select a differential equation with homogenous coefficients from problem number 5 in section 4.2.

(a) Plot the slope field of your dif eq in three different windows:

$$-0.1 < x < 0.1, -0.1 < y < 0.1$$

$$-1 < x < 1, -1 < y < 1$$

$$-10 < x < 10, -10 < y < 10.$$

What do you observe?

(b) Let  $y(x)$  a solution of your differential equation. Define  $\bar{y}(x) = 10y(x/10)$ . Show that  $\bar{y}(x)$  is also a solution of your differential equation. (There is nothing special about 10. This works for any constant.) Explain this in light of your observation from part (a).

(c) Challenge: Consider a general differential equation

$$\frac{dy}{dx} = G(y/x) \tag{1}$$

Show that if  $y(x)$  is a solution then  $\bar{y}(x) = cy(x/c)$  is a solution for every nonzero constant  $c$ .