Please turn in the following:

NAME
HOME TOWN
MAJOR & INTEREST
CAREER OBJECTIVE
COMPUTER SKILLS

Some definitions to start things off ...

Differential Equation - An equation (has an = sign) which contains one or more derivatives of an unknown function.

Ex $\frac{dx(t)}{dt} = r(t)$, , $\frac{d^2u}{dt^2} + \frac{du}{dt} + u = f(t)$

There are two main types of DEs.

1. Ordinary DEs
   involve derivatives of functions which depend on a single independent variable.
2. Partial DEs
   involve derivatives of functions which depend on more than one independent variable and hence have partial derivatives.

We will primarily be concerned with ordinary DEs

Consider the equation $\frac{dy}{dt} = -y + t$

This means that the rate of change of y with respect to t will tend to decrease as y increases and will tend to increase as t increases

$\left.\frac{dy}{dt}\right|_P$ is the slope of the curve $y(t)$ passing through point P. Thus the <u>direction</u> of $y(t)$ at $t = t_0$ is equal to $-y(t_0) + t_0$.

Using this, we can plot a <u>direction field</u> for this differential equation

(show web applet)

Consider $dy/dt = ay$ where a is a constant.
Plot direction fields for $a = -2, -1, 0, 1, 2$

Given different starting points (initial conditions) do the curves $y(t)$ tend to look similar or different?

What is their long-term behavior (as $t \to \infty$)

Now try $dy/dt = y + b$

$dy/dt = ay + b$