

Differential Equations – Activity

Professor:

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Now lets try an activity with dfield:

1. Test out dfield. Construct a slope field using dfield for the function: $y' = x + y$. On your paper draw the particular solutions if $y(0) = 0$. From this particular solution estimate $y(-4)$. What if instead $y(0) = -2$, how does your particular solution change?
2. Imagine that you bail out of a helicopter and pull the ripcord of your parachute. The differential equation modeling this system is give by:

$$\frac{dv}{dt} = 32 - 1.6v \quad v(0) = 0$$

Where $v(t)$ is your downward velocity measured in feet per second. Here, $32ft/s$ is the acceleration of gravity and $1.6v$ represents the fact that the parachute will have some wind resistance. Your initial condition is $v(0) = 0$ which means that you initial velocity is zero, you neither jump or throw yourself downward. For you physics sticklers... I know we are only modeling the movement in the up down direction and there is lots that could happen horizontally, but we ignore this. Please do the following:

- Construct a slope field for this ODE.
- What does the initial condition mean?
- Using this initial condition plot your particular solution on the dfield.
- Answer the following questions.
 - (a) What happens as $t \rightarrow \infty$?
 - (b) What if $v(0) = -1$? What does this mean you did at the beginning? Does this change the final outcome?
 - (c) What if $v(0) = 30$? What does this mean you did at the beginning? Does this change your long term solution?
 - (d) Do your solutions seem to make sense? Why?
 - (e) What is your terminal velocity?
 - (f) What if you got a bigger parachute? Which term would change in the ODE? What happens to your long term solutions?