# §9.2 Direction Fields and Euler's Method

## In-class Activity 9.2

Dr. Jorge Basilio

Pasadena City College

gbasilio@pasadena.edu

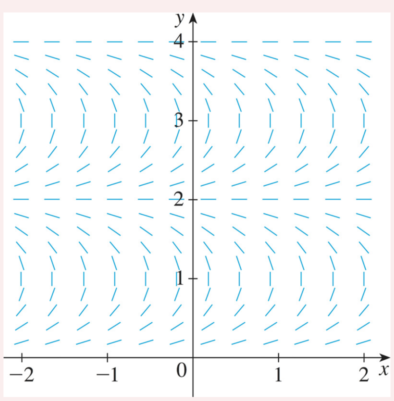
### Activity 1:

(a) Sketch the slope field of the DE: $y' = x^2$ with $x \in \{-2, -1, 0, 1, 2\}$ and $y \in \{-2, -1, 0, 1, 2\}$

(b) Use part (a), to sketch the graph of the particular solution passing through the origin.

### Activity 2:

The slope field for the DE $y' = \tan\left(\frac{1}{2}\pi y\right)$ is given below:




(a) Sketch the graph of particular solution that satisfies the **initial conditions** $y(1) = 3$

(b) Identify all **equilibrium solutions** (i.e. constant solutions)

## Activity 3:

Consider the **Initial Value Problem (IVP)**: $y' = y$; $y(0) = 1$

(a) Use Euler's Method with step size $0.25$ to find the equations of the tangent lines $L_0(x)$ and $L_1(x)$. Then use these compute the approximate $y$-values: $y_1 = L_0(x_1)$ and $y_2 = L_1(x_2)$

(b) Keep going until you can approximate $y(1)$ where $y(x)$ represents the exact solution. That is, find $y_4 = L_3(x_4)$.

(c) What is the significance of $y_4$?

## Activity 4:

Consider the IVP: $y' = y - x$ with $y(0) = \frac{1}{2}$.

(a) Use Euler's Method with step size $h = 0.2$ to approximate $y(1)$ where $y(x)$ is the exact solution.

(b) Use the link above to approximate $y(1)$ with step size $h = 0.1$.

(c) Compare the **errors** from parts (a) and (b) to the exact solution $y(x) = 1 + x - \frac{1}{x}e^{x}$