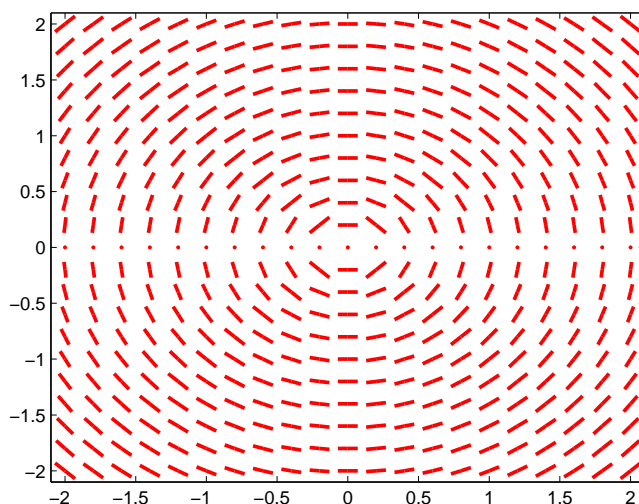


Slope Fields and Euler's Method

Exercise

Consider the differential equation $y' = -x/y$ with initial condition $y(0) = 1$. Given that the exact solution is $y(x) = \sqrt{1 - x^2}$,

- use the slope field to estimate $y(1/2)$ for the solution that satisfies the given initial condition.
- Compare your estimate with the exact value of $y(1/2)$
- Use Euler's Method with $\Delta x = .25$ to estimate $y(1/2)$.
- Is your Euler's Method estimate and over-estimate or under-estimate? Explain why.



To use Euler's Method generally the following table can be helpful

x	y	y'	Δy

Numerical Error in Using Euler's Method

GROUPWORK

Complete the following sentences:

As the time step Δt _____ in magnitude, the numerical error in computing $y(x_0)$ using Euler's Method decreases in magnitude.

As the time step Δt _____ in magnitude, the numerical error in computing $y(x_0)$ using Euler's Method increases in magnitude.

When y'' is _____ on $x_0 < x < x_1$ the function $y(x)$ is concave up and estimates of $y(x_1)$ using Euler's Method will be _____.

When y'' is _____ on $x_0 < x < x_1$ the function $y(x)$ is concave down and estimates of $y(x_1)$ using Euler's Method will be _____.