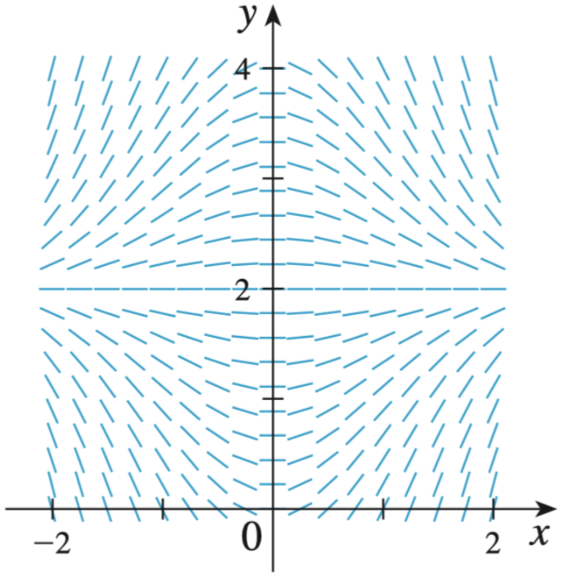
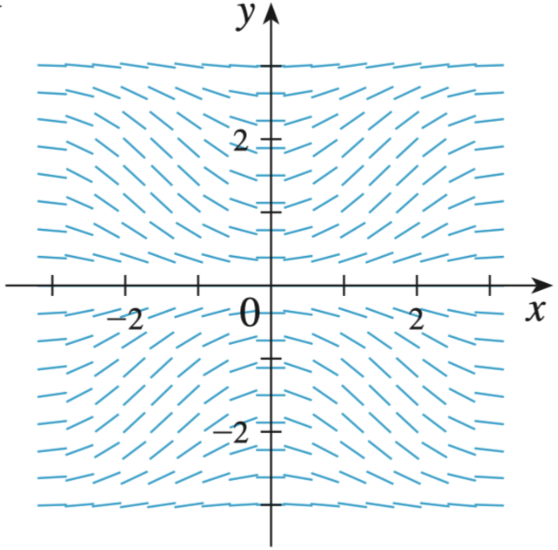
What is Euler's Method?

Quick Check - Match the slope field with the differential equation.

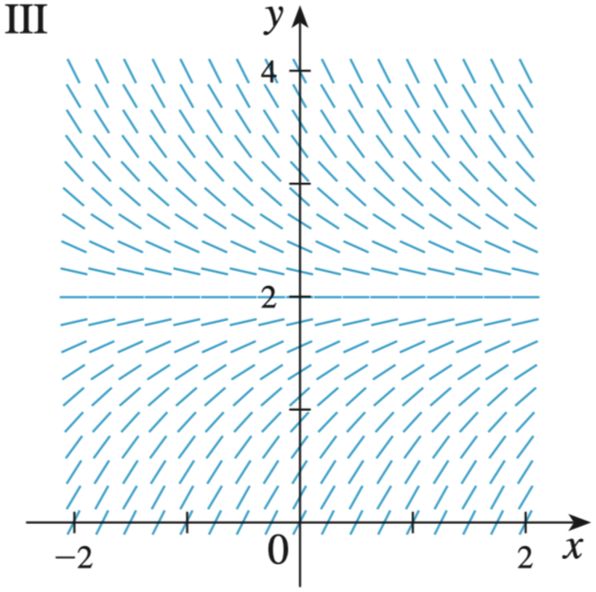
I



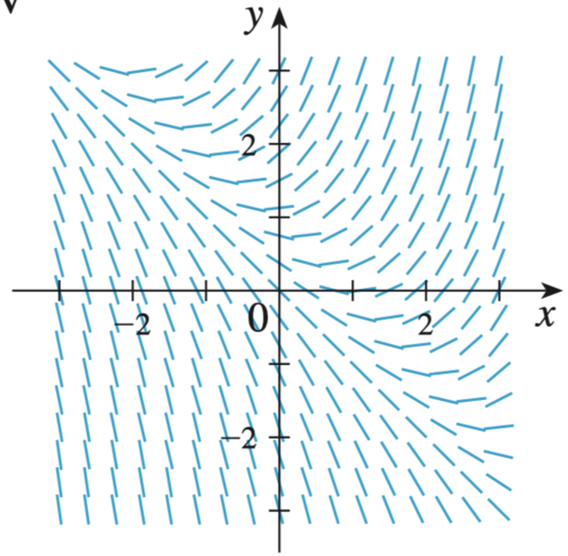
II



III



IV



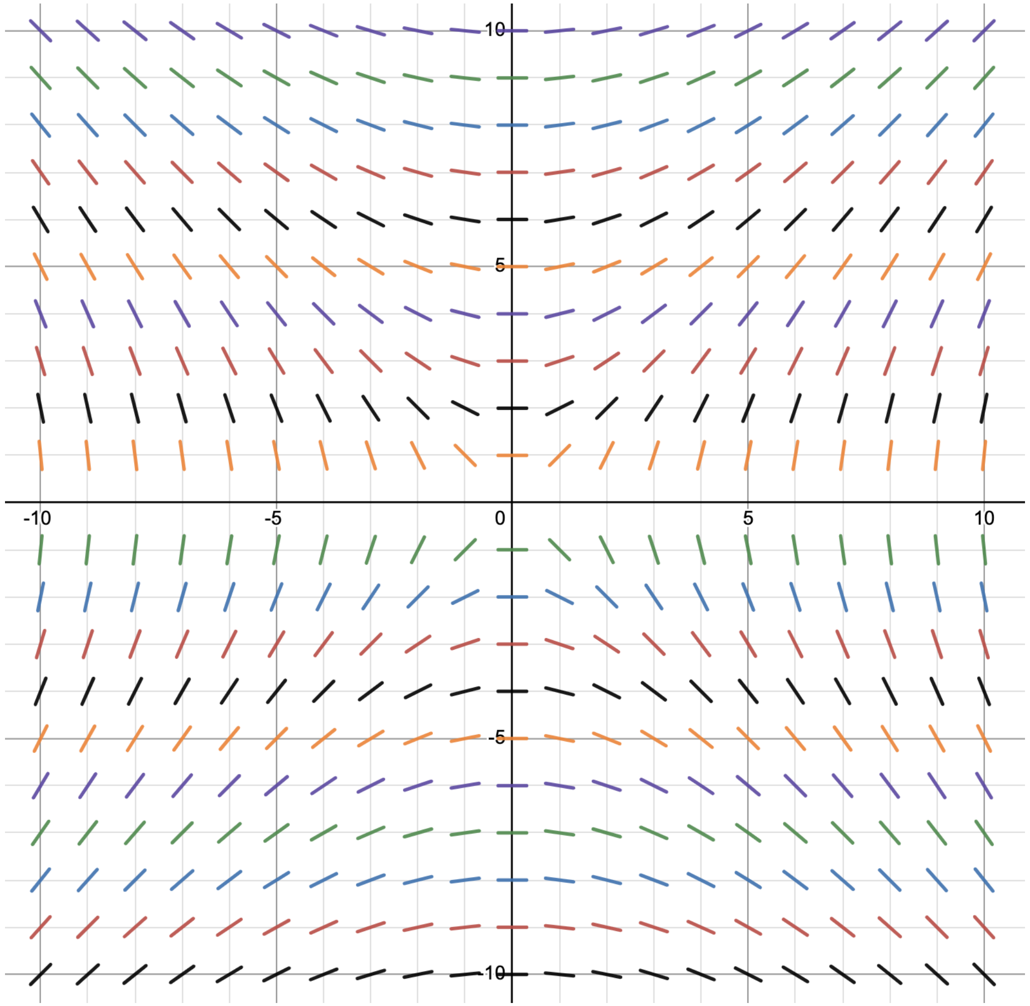
1 $y' = 2 - y$

2 $y' = x(2 - y)$

3 $y' = x + y - 1$

4 $y' = \sin x \sin y$

Slope Field

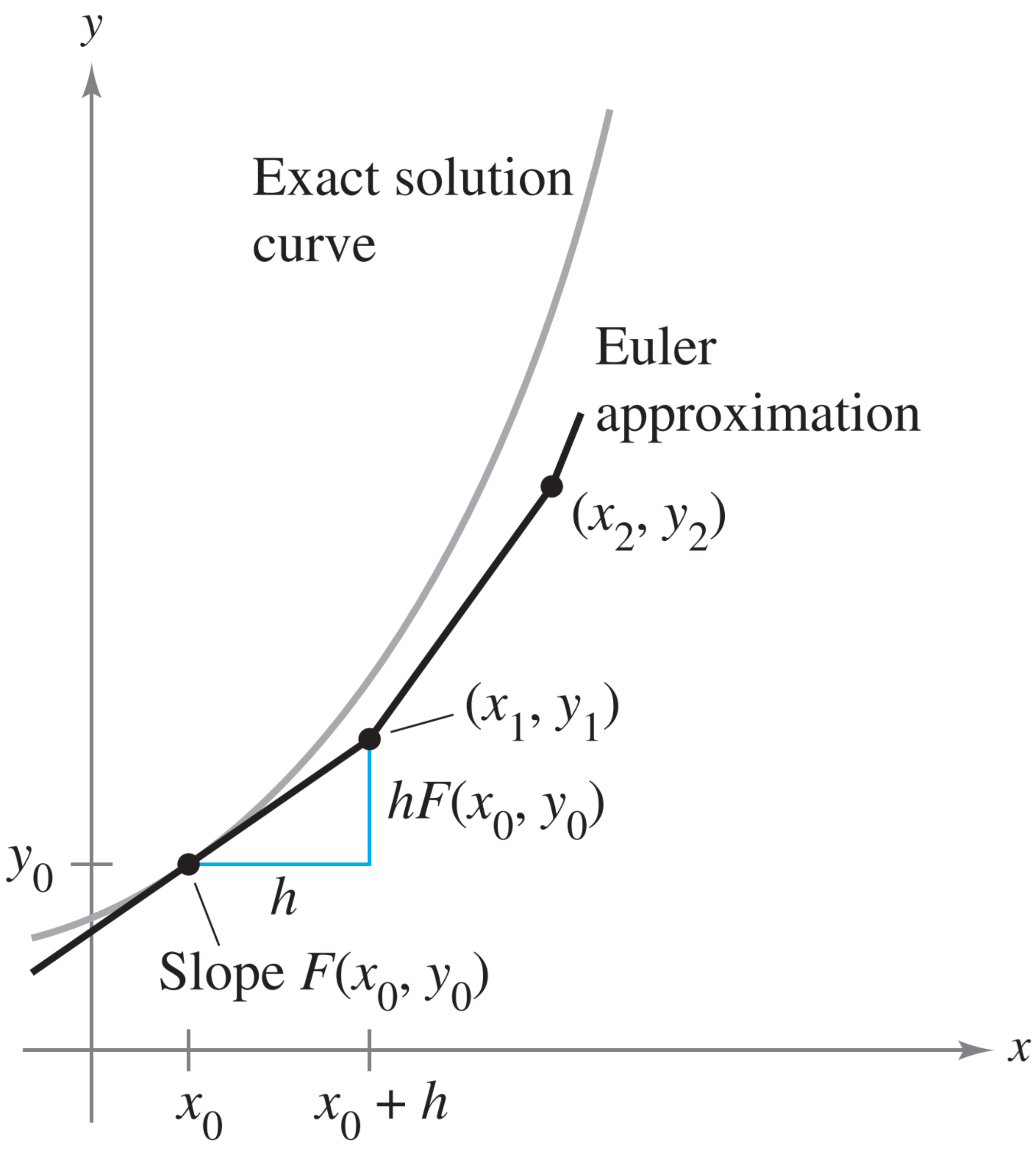


Direction field for $\dfrac{dy}{dx} = \dfrac{x}{y}$

Let's look at the general solution algebraically!

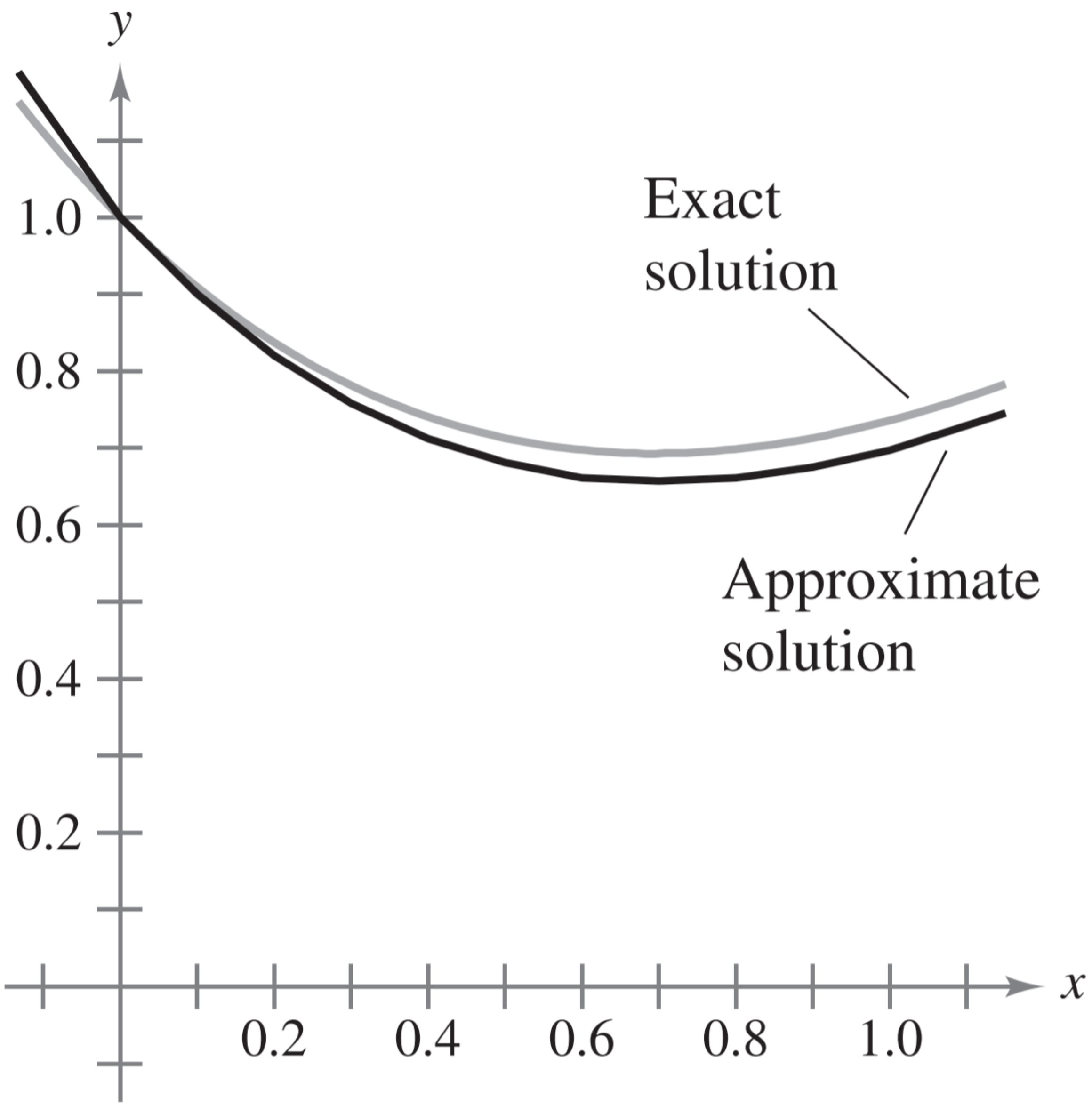
Euler's Method

Euler's Method is a numerical approach to approximating the particular solution of the differential equation $y' = F(x, y)$ that passes through the point (x_0, y_0).



Approximating a solution using the Euler's Method

Use Euler's Method to approximate the particular solution of the differential equation $y' = x - y$ passing through the point $(0, 1)$. Use a step of $h = 0.1$.



2009 Free Response (AP)

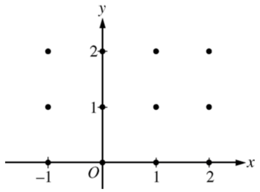
Consider the differential equation $\frac{d}{dx} = 6x^2 - x^2y$. Let $y = f(x)$ be a particular solution to this differential equation with the initial condition $f(-1) = 2$.

a. Use Euler's Method with two steps of equal size, starting at $x = -1$, to approximate $f(0)$. Show the work that leads to your answer.

2005 Free Response (AP)

Consider the differential equation $\frac{dy}{dx} = 2x - y$.

1. Sketch a slope field for the given differential equation at the twelve points indicated and sketch the solution curve that passes through the point $(0,1)$.



2. The solution curve that passes throught the point $(0,1)$ has a local minimum $x = \ln\frac{3}{2}$. What is the $y-$ coordinate of this local minimum?

2005 Free Response (AP) - Continued

Consider the differential equation $\frac{dy}{dx} = 2x - y$.

3. Let $y = f(x)$ be the particular solution to the given differential equation with the initial condition $f(0) = 1$. Use Euler's Method, starting at $x = 0$ with two steps of equal size, to approximate $f(-0.4)$. Show the work that leads to your answer.
4. Find $\frac{d^2y}{dx^2}$ in terms of x and y. Determine whether the approximation found in part (3) is less than or greater than $f(-0.4)$. Explain your reasoning.