

Find the general solution to the exact differential equation.

$$1) \frac{dy}{du} = u^4 - \frac{1}{u^4}$$

$$2) \frac{dy}{dx} = \frac{7}{\sqrt{x}} - \frac{1}{x^2 + 1}$$

Use separation of variables to solve the initial value problem.

$$3) \frac{dy}{dx} = 6xy \text{ and } y = 2 \text{ when } x = 0$$

$$4) \frac{dy}{dx} = \frac{9x^2}{\sqrt{y}} \text{ and } y = 1 \text{ when } x = 0$$

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

a) On the axis provided, sketch a slope field for the given differential equation at the twelve points indicated



b) Find the solution  $y = f(x)$  to the given differential equation with the initial condition

c) Given that  $f(-1) = 2$  and  $\frac{dy}{dx} = \frac{xy^2}{2}$ , what is the approximation for  $f(0)$  if Euler's Method is used with step size of .5, starting at  $x = -1$ .