Calculus Section 6.1 Slope Fields

-Use initial conditions to find particular solutions of differential equations
-Use slope fields to approximate solutions of differential equations

Homework: Slope Field Worksheet

Not all differential equations can be solved using separation of variables. These are called inseparable differential equations (you will learn how to solve these is a class called "Ordinary Differential Equations"). You can graphically represent the solution to a differential equation using a **slope field**. Slope fields use short line segments to represent the tangent lines of the solution to the differential equation at many different points. Together, the many segments give a fuller picture of what the solution would look like.

Example)

Use separation of variables to find the solution to the differential equation $\frac{dy}{dx} = x$. Then, graph the slope field for the differential equation at the points indicated on the graph.

$\frac{dy}{dx} = x$

$\int dy = \int x\,dx$

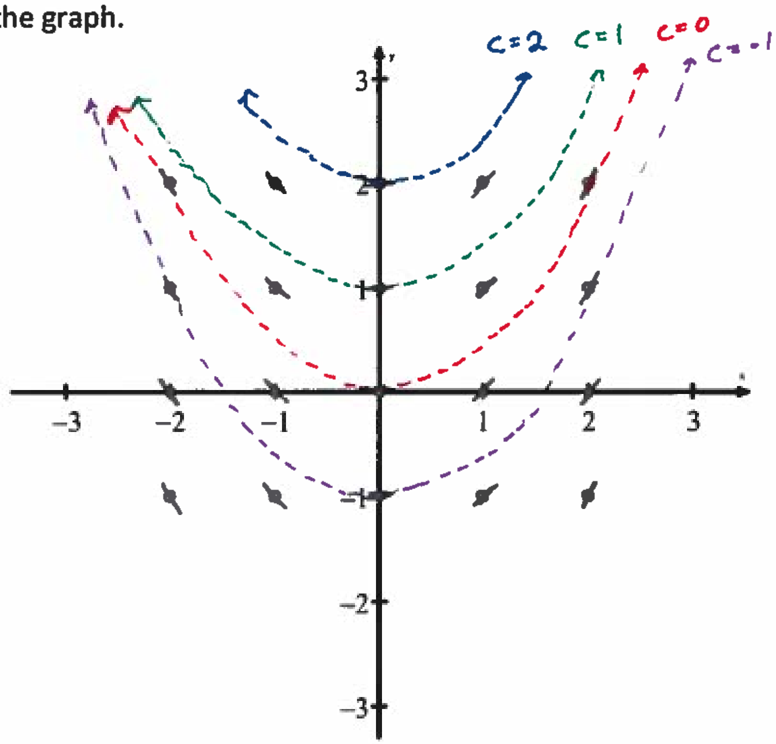
$y = \frac{1}{2}x^2 + C$

$\frac{dy}{dx}$ @ $(0,0) = 0$

$\frac{dy}{dx}$ @ $(1,0) = 1$

$\frac{dy}{dx}$ @ $(2,0) = 2$

etc.



You can see the various solutions for the general solution to $\frac{dy}{dx} = x$ based on the value of C. You can also graph a particular solution on a slope field if you are given a point that the curve passes through. Begin at the initial condition and use the slope to sketch an approximate path for the solution curve.

Sketch a slope field for the differential equation $y' = 2x + y$ at the indicated points. Sketch the solution that passes through (1, 1).

y' @ $(1,1) = 3$

y' @ $(0,1) = 1$

y' @ $(-1,1) = -1$

etc.