Antiderivatives & Slope Fields (Section 7.1)

* When finding an indefinite integral, → $\int f(x)\,dx = F(x) + C$ make sure to add a constant to the antiderivative function.

ex: $\int (8x^3 - 6x^2 + 5x - 3)\,dx$

$= \frac{8x^4}{4} - \frac{6x^3}{3} + \frac{5x^2}{2} - 3x + C$

$= 2x^4 - 2x^3 + \frac{5}{2}x^2 - 3x + C$

ex: $\int (\sec^2 x + x)\,dx$

$= \tan x + \frac{x^2}{2} + C$

* If you are given an initial condition, you can solve for C.

ex: $\int (3x^2 - 6x + 7)\,dx$; $y(1) = -2$

$= \frac{3x^3}{3} - \frac{6x^2}{2} + 7x + C$

$y = x^3 - 3x^2 + 7x + C$

$-2 = (1)^3 - 3(1)^2 + 7(1) + C$

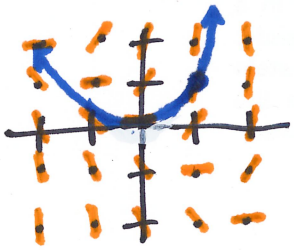
$-2 = 5 + C$

$C = -7$ → $y = x^3 - 3x^2 + 7x - 7$

* Slope Fields: A plot of short line segments with slopes f(x,y) for a lattice of points (x,y) in the plane.

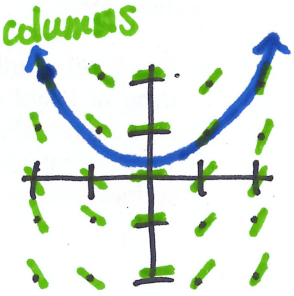
ex: $f'(x,y) = x + y$

(1, 1)



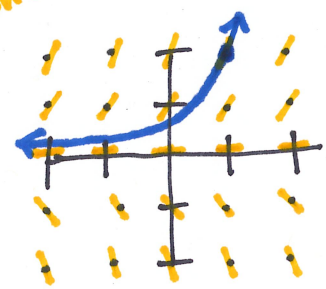
ex: $\frac{dy}{dx} = x$

(-2, 2)



ex: $\frac{dy}{dx} = y$

(1, 2)



ex: $\frac{dy}{dx} = x - y$

(-1, 1)