Look over HW Sols to

Der. of Inv. Functions.

Questions?

① $f(x) = x^3 + 2x - 1$ @ $x = 2$

$x^3 + 2x - 1 = 2$

$x^3 + 2x - 3 = 0$

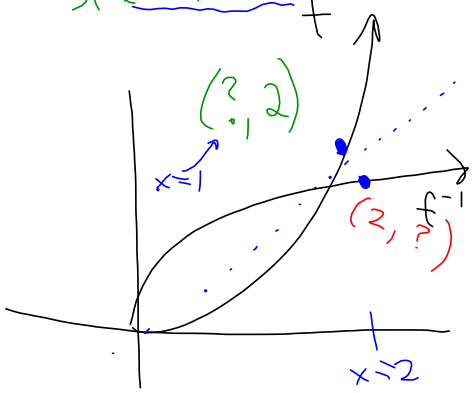
$(x-1)(x^2 + x + 3) = 0$

$x = y^3 + 2y + 1$

$1 = (3y^2 + 2)\frac{dy}{dx}$

$\frac{dy}{dx} = \frac{1}{3y^2 + 2}$

$\left.\frac{dy}{dx}\right|_{\substack{x=2 \\ y=1}} = \frac{1}{5}$



Solve the differential eqn:

$$f''(x)=2,\quad f'(4)=1,\quad f(-1)=2$$

$$f'(x)= 2x + C = 2x - 7$$

$$f'(4)= 2(4) + C = 1$$
$$C = -7$$

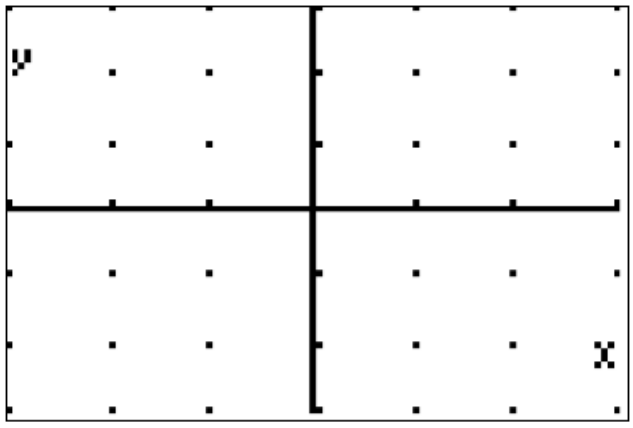
$$f(x)= x^2 - 7x + C = x^2 - 7x - 6$$

$$f(-1)= 1 + 7 + C = 2$$
$$C = -6$$

**Slope Fields, DEQ's, Exponential Growth** PRETEST **Name** _____

1. Complete the chart and create a slope field for the differential equation $\frac{dy}{dx} = \frac{x^2}{y}$

| x \ y | −2 | −1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| 2 | -2 | −4 | und | 4 | 2 |
| 1 | | | | | |
| 0 | | | | | |
| −1 | | | | | |
| −2 | | | | | |



Solve the following differential equations:

2. $\frac{dy}{dx} = \frac{x-1}{2y}$

$\int 2y\,dy = \int (x-1)\,dx$

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

$y = \pm\sqrt{\frac{x^2}{2} - x + C}$

3. $\frac{dy}{dx} = y\cos x$

$\frac{dy}{y} = \cos x\,dx$

4. A rash is expanding in area at the rate that is proportional to its current area. If its size at 2 PM is 2 square inches and at 2.30 PM, its size is 2.75 square inches, what will be its size at 5 PM? Show all work.

# Differential Equations by Separation of Variables - Classwork

A differential equation will be in the form of $\frac{dy}{dx} = f(x) \cdot g(y)$. In order to solve it, you must put it in the form of $g(y) \cdot dy = f(x) \cdot dx$ allowing you to integrate. Your goal is to get an equation in the form of $y = h(x)$

1) $\frac{dy}{dx} = \frac{2x}{y}$

$y\,dy = 2x\,dx$

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

$y^2 = 2x^2 + C$

$y = \pm\sqrt{2x^2 + C}$

2) $\frac{dy}{dx} = y^2$

$\frac{dy}{y^2} = dx$

$-y^{-1} = x + C$

$y^{-1} = -x + C$

$\frac{1}{y} = -x + C$

$y = \frac{1}{-x + C}$

3) $\frac{dy}{dx} = \frac{x + \sin(x)}{3y^2}$

$3y^2\,dy = (x + \sin x)\,dx$

$y^3 = \frac{x^2}{2} - \cos x + C$

$y = \sqrt[3]{\frac{x^2}{2} - \cos x + C}$

4) $\frac{dy}{dx} = 4y$

$\frac{dy}{y} = 4\,dx$

$\ln|y| = 4x + C$

$e^{\ln y} = e^{4x+C}$

$y = e^{4x}e^{C}$

$y = Ce^{4x}$

5. $\frac{dy}{dx} = ky$

$\frac{dy}{y} = k\,dx$

$\ln|y| = kx + C$

$y = Ce^{kx}$

6) $\frac{dy}{dx} = xy$

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

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

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

$y = Ce^{x^2/2}$

7. $\frac{du}{dt} = e^{u+2t}$

8. $\frac{dx}{dt} = 1 + t - x - tx$

$$\frac{du}{dt} = e^{u} e^{2t}$$

$$\frac{du}{e^{u}} = e^{2t}\, dt$$

$$-e^{-u} = \frac{1}{2} e^{2t} + C$$