

1. (3pts) Give the general solution to the following differential equation:

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

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

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

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

2. (4pts) Find the solution to the following initial value problem:

$$(x^2 + 1)y' = xy$$

$$y(1) = e^2$$

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

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

$$y = A\sqrt{x^2 + 1}$$

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

3. (3pts) Match each differential equation with its direction field. (No need to show your work.)

(a)  $y' = 3x - y$  corresponds to picture number: 2

(b)  $y' = 2y - 1$  corresponds to picture number: 1

(c)  $y' = xy$  corresponds to picture number: 3