Assignment #2 ***Math 290*** ***Name:***

1. Determine whether the following DE has a unique solution:

a) $\frac{dy}{dx} = \sin(3x + y);\ y(\pi) = 0$

b) $\frac{dy}{dx} = (4x - y)^{2/3};\ y(0) = 0$

c) $\frac{dy}{dx} = \tan(xy);\ y\left(\frac{\pi}{3}\right) = 1$

2. Verify y(x) is a solution, then use the initial values to determine the constants c_1 *and* c_2

a) $y = e^{-2x}\left(c_1 \cos\left(\sqrt{5}x\right) + c_2 \sin\left(\sqrt{5}x\right)\right)$ *for* $y'' + 4y' + 9y = 0;\ y(0) = 1,\ y'(0) = -2$

b) $y = c_1 e^{3x} + c_2 e^{-x} - 2x$ *for* $y'' - 2y' - 3y = 6x + 4\ y(1) = 4$ *and* $y'(1) = -2$

3. Sketch the phase-diagram, isocline of the following autonomous DE, then determine stable, unstable and semi-stable equilibrium solutions:

a) $\frac{dy}{dx} = -3y^2 + 17y - 10$

b) $\frac{dy}{dx} = y^3 - 5y^2 - 4y + 20$

c) $\frac{dy}{dx} = -2y^3 + 14y^2 - 30y + 18$

4. Sketch the isoclines of the following DE:

a) $\frac{dy}{dx} = -\frac{x}{y}$

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