MATH 290 – QUIZ #1 *Name:* Key

Directions: Please show all work for maximum credit. This quiz is worth 10 points. Good luck!

(5 points) 1. Solve the following initial-value problem.

$$\left(x^2+1\right)y'+y^2=-1, \quad y(0)=1$$

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

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

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

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

$$-\tan^{-1}1 = \tan^{-1}0 + C$$

$$-\frac{\pi}{4} = 0 + C$$

$$C = -\pi/4$$

$$-\tan^{-1}y = \tan^{-1}x - \pi/4$$

(5 points) 2. Solve the following differential equation: $\cos x\frac{dy}{dx}+y\sin x=1$

$$\frac{dy}{dx} + \tan x\, y = \sec x$$

$$\mu(x) = e^{\int \tan x\,dx} = e^{-\ln|\cos x|} = \sec x$$

$$\frac{d}{dx}\left[(\sec x)\,y\right] = \sec^2 x$$

$$(\sec x)\,y = \tan x + C$$

OR

$$y = \tan x \cos x + C\cos x$$