First Order Equations – Review Examples for Midterm I

Solve the following ODEs (or IVPs).

$$\frac{dr}{d\theta} = r\tan\theta$$

$$\frac{ydx - xdy}{y^2} = 0$$

$$\frac{dy}{dx} - 2xy = e^{x^2}$$

$$x^2y'' + 3xy' = 2$$

$$y' = 5y \qquad \text{and } y(0) = 7.$$

$$\frac{y}{x}\cos\frac{y}{x}dx - \left(\frac{x}{y}\sin\frac{y}{x} + \cos\frac{y}{x}\right)dy = 0$$

$$y\cos xdx + \sin xdy = 0$$

$$x\frac{dy}{dx} + 3y = \frac{\sin x}{x^2} \qquad \text{and } y(\pi/2) = 1.$$

$$(y^2+1)dx - (x^2+1)dy = 0$$

$$\frac{dy}{dx} + xy = \frac{x}{y^3}$$

$$y'' = 2y(y')^3$$

$$\frac{xdy - ydx}{x^2} = 0$$

$$(x^2+y^2)dy + 2xydx = 0$$

$$\frac{2xydx - x^2dy}{y^2} = 0$$

$$y' = (4x+y)^2$$

$$\frac{xdy - ydx}{x^2+y^2} = 0$$