MATH 2070 HOMEWORK 2

1. Find the solution of the following IVP

$$t^2y' + 2ty = \cos t, y(\pi) = 0, t > 0.$$

$$ty' + 3y = \cos t, y(\pi) = 0, t > 0.$$

$$ty' + (1 + t)y = e^{-t} \sin 2t, y(\pi) = 0, t > 0.$$

2. Find the solution of the following IVP that is continuous everywhere

$$y' + y = g(t), y(0) = 1, g(t) = \begin{cases} t & 0 \le t < 1 \\ 0 & t \ge 1 \end{cases}$$

$$(1 + t^2)y' + 2ty = g(t), y(0) = 0, g(t) = \begin{cases} t & 0 \le t < 1 \\ -t & t \ge 1 \end{cases}$$

3. Find a one-parameter family of solutions of the following ODEs

$$\frac{dy}{dx} = \frac{x - e^{-x}}{y + e^y}.$$

$$xy' = \sqrt{9 - y^2}.$$

$$\frac{dy}{dx} = \frac{xy + 2y - x - 2}{xy - 3y + x - 3}.$$

4. Find the *explicit* solution of the following IVPs and the interval of existence.

$$y' = (1 - 2x)y^2, y(0) = -1/6.$$

$$y' = \frac{x(x^2 + 1)}{4y^3}, y(0) = -1/\sqrt{2}.$$

$$(2y - 2)y' = 3x^2 + 4x + 2, y(1) = -2.$$