Exam	Mock exam problems in Differential Equations for GRA 6035 Mathematics
Date	November, 2017

You must give reasons for your answers. Precision and clarity will be emphasized when evaluating your answers.

Question 1.

Find the general solutions of the following differential equations:

(a) **(6p)** $y'' - 2y' - 3y = 4e^t$
(b) **(6p)** $2ty - 1 + t^2y' = 0$
(c) **(6p)** $2ty\,y' = 1$

Question 2.

Find all equilibrium states of the following differential equation, and determine their stability. Are any of the equilibrium states globally asymptotically stable?

(a) **(6p)** $y' = 4e^y - 2$
(b) **(6p)** $y' = y^2 - 3y + 2$

Question 3.

We consider the following system of differential equations:

$$\begin{pmatrix} y' \\ z' \end{pmatrix} = \begin{pmatrix} 4 & -2 \\ -5 & 1 \end{pmatrix} \cdot \begin{pmatrix} y \\ z \end{pmatrix}$$

(a) **(6p)** Find the general solution of the system.
(b) **(6p)** Find the equilibrium states of the system, and determine their stability.