Ma 2 - Written Homework #3
Due Monday, October 17, 2016 before 4pm

Name (Print):

Please write down the question number at the beginning of your solution. You can use
this sheet as a cover.

1. (10 points) Section 2.5
Look for the equilibrium solutions of the equation
\[ \frac{dy}{dt} = y - 2y^2, \quad y(0) \in (0, \infty). \]
And classify them as asymptotically stable, unstable after solving the differential equations.

2. (10 points) Section 2.6
Determine whether the equation
\[ \frac{x}{(x^2 + y^2)^{\frac{3}{2}}} + \frac{y}{(x^2 + y^2)^{\frac{3}{2}}} \frac{dy}{dx} = 0 \]
is exact. If it is exact, find the solution.

3. (10 points) Section 2.6
The following equation is not exact. Find the integrating factor and solve the equation,
given that the integrating factor is a function of y.
\[ y + (2xy - e^{-2y})y' = 0. \]
Please include the steps.

4. (10 points) Section 3.1
Find the solution to the initial value problem
\[ 4y'' - y = 0, \quad y(0) = 2, \quad y'(0) = \beta. \]
The find \( \beta \) so that the equation approaches zero as \( t \to \infty \).

5. (10 points) Section 3.1
Solve the initial value problem
\[ y'' + 4y' + 3y = 0, \quad y(0) = 2, \quad y'(0) = -1. \]
<table>
<thead>
<tr>
<th>Question</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Points:</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Score:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>