NAME (please print legibly): ________________________________
Your University ID Number: ______________________________
Indicate your instructor with a check in the box:

<table>
<thead>
<tr>
<th>Instructor</th>
<th>Time</th>
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<tbody>
<tr>
<td>Dan-Andrei Geba</td>
<td>MWF 10:00 - 10:50 AM</td>
</tr>
<tr>
<td>Ang Wei</td>
<td>MW 2:00 - 3:15 PM</td>
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</tbody>
</table>

• The presence of electronic devices (including calculators), books, or formula cards/sheets at this exam is strictly forbidden.

• Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.

• Clearly circle or label your simplified final answers.

• You are responsible for checking that this exam has all 7 pages.

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<tr>
<th>QUESTION</th>
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<td>TOTAL</td>
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1. **(10 points)** Find the general solution for the equation

\[ \frac{dy}{dt} + \frac{2t + 1}{t} y = 2t. \]
2. (10 points) Solve the initial value problem

\[
\frac{dy}{dx} = 2xy^2 + 3x^2y^2, \quad y(1) = -1.
\]
3. **(10 points)** A 400-gal tank initially contains 100 gal of brine containing 50 lb of salt. Brine containing 1 lb of salt per gallon enters the tank at the rate of 5 gal/s, and the well-mixed brine in the tank flows out at the rate of 3 gal/s. How much salt will the tank contain when it is full of brine?
4. (10 points) Find the rank for the matrix

\[ A = \begin{bmatrix}
1 & 2 & 1 & 0 \\
2 & 5 & 5 & 1 \\
-2 & -3 & 0 & 3 \\
3 & 4 & -2 & -3
\end{bmatrix} \]

by computing its reduced row-echelon form.
5. **(10 points)** Solve the following linear system of equations:

\[
\begin{align*}
    x + y - z &= 5 \\
    3x + y + 3z &= 11 \\
    4x + y + 5z &= 14
\end{align*}
\]
6. (10 points) Find the inverse of the matrix

\[ A = \begin{bmatrix} 4 & 3 & 2 \\ 5 & 6 & 3 \\ 3 & 5 & 2 \end{bmatrix}. \]