

**MATH 252****REVIEW****Spring 2008**

1.  $y' = \frac{x - xy}{x^2 + 1}.$

2.  $y' + \frac{1 - 2x}{x}y = \frac{6}{x}, \quad x > 0$

3.  $2y'' - 5y' - 12y = 0.$

4.  $y'' - 4y = 16e^{2x} + 5 \cos x.$

5. Use Variation of Parameters to solve  $y'' + 2y' = 6e^{-2x}.$

6.  $x^2y'' + xy' - 9y = 0, \quad x > 0.$  Prove your solutions are linearly independent.

7. Find the first two nonzero terms in the two linearly independent power series solutions of:  $y'' + y' - xy = 0.$

8. Classify all points:  $(x^2 - 1)y'' + xy' - 4y = 0.$

9.  $\mathcal{L}^{-1}\left\{\frac{12}{s^2 - 4s}\right\} =$

10.  $\mathcal{L}^{-1}\left\{\frac{e^{-2s}}{s(s+1)}\right\} =$

11. Find  $F(s)$  if  $f(t) = (3 - e^{2t})^2$

12.  $\vec{x}' = \begin{pmatrix} -4 & 3 \\ -3 & 6 \end{pmatrix} \vec{x}, \quad \vec{x}(0) = \begin{pmatrix} 4 \\ -4 \end{pmatrix}.$

13.  $\vec{x}' = \begin{pmatrix} 2 & -4 \\ 4 & -6 \end{pmatrix} \vec{x}, \quad \vec{x}(0) = \begin{pmatrix} 2 \\ -1 \end{pmatrix}.$

14. Find  $y(t)$  using Laplace transforms:

$$y' - 3y = \delta(t - 2), \quad y(0) = 1.$$

15. Find  $y(t)$  using Laplace transforms:

$$y'' + 4y' + 3y = 36t, \quad y(0) = 1.$$

Check by constructing solution using methods in Chapter 4.

16. Find the eigenvalues and eigenvectors:  $\begin{pmatrix} 3 & -1 & 1 \\ -1 & 5 & -1 \\ 1 & -1 & 3 \end{pmatrix}$