

Math 217 - September 28, 2010

Solutions

- Repeated root
 - n -th order linear equations
1. Find the roots to $r^2 - 6r + 9 = 0$.
 2. Find a solution to $y'' - 6y' + 9y = 0$.
 3. Show that $y = xe^{3x}$ is a solution to $y'' - 6y' + 9y = 0$.
 4. Are these linearly independent: $\{e^{3x}, xe^{3x}\}$?
 5. Show that $y = xe^{rx}$ is a solution to $y'' - 2ry + r^2y = 0$. Find a second linearly independent solution.

Lecture Problems

6. Determine the determinants

$$\begin{vmatrix} 1 & 2 & 3 \\ 0 & 2 & 1 \\ -1 & 0 & -2 \end{vmatrix} =$$
$$\begin{vmatrix} 2 & 1 & 5 \\ 1 & 0 & 0 \\ -4 & 7 & 0 \end{vmatrix} =$$

7. Determine if the functions are linearly independent.
 - (a) $\{x, x^2, x^3\}$ **Solution:** $W = 2x^3$
 - (b) $\{x, x^2, x^2 - 2x\}$ **Solution:** $W = 0$
 - (c) $\{1, x, \sin x\}$ **Solution:** $W = \sin x$
 - (d) $\{x, \ln x, \ln x^2\}$ **Solution:** $W = 0$
 - (e) $\{x, \ln x, x \ln x\}$ **Solution:** $W = (2 - \ln x)/x$
8. Given that $y_p = 2 \cos x$ is a solution to the equation below, find the general solution.

$$y'' - 5y' + 6y = 10 \sin x + 10 \cos x$$

9. Given that $y_p = x + 2$ is a solution to the equation below, find the general solution.

$$y'' - 2y' + y = x$$

10. Find the general solution to

$$y^{(4)} + 2y^{(3)} - 13y'' + 10y = 0$$

Solution: $y = c_1 + c_2e^x + c_3e^{2x} + c_4e^{-5x}$