

## Spring 2024 – Math 3331 – Homework 5

1. Solve the following ODEs

(i)  $y'' = 1 + y'^2$

(ii)  $xy'' + y'^2 = y'$ ,  $y(1) = 2$ ,  $y'(1) = 1$

(iii)  $\frac{d^2y}{dx^2} + \frac{1}{y^3} = 0$

(iv)  $yy'' + y' = y'^2$

2. Given one solution, find the second linearly independent solution

(i)  $y'' - 2y' - 3y = 0$ ,  $y_1 = e^{3x}$  (T10)

(ii)  $x^2y'' + xy' - y = 0$ ,  $y_1 = x$  (T13)

(ii)  $x^2y'' - xy' + y = 0$ ,  $y_1 = x$  (T14)

(iii)  $(x - 1)y'' - xy' + y = 0$ ,  $y_1 = e^x$  (T17)

3. Solve the following

(i)  $y'' + 5y' - 6y = 0$ , (T1)

(ii)  $y'' - 4y' + 5y = 0$ , (T2)

(ii)  $y'' - 4y' + 4y = 0$ , (T4)

(iv)  $y'' + 14y' + 50y = 0$ ,  $y(0) = 2$ ,  $y'(0) = -17$ , (T13)

(v)  $y'' + 7y' + 12y = 0$ ,  $y(0) = -1$ ,  $y'(0) = 0$ , (T18)

(vi)  $y'' - 6y' + 9y = 0$ ,  $y(0) = 0$ ,  $y'(0) = 2$ , (T19)

Due: Monday Mar. 3, 2024