Sheet 3 (Differential Equations)

1st order differential equations

1. $y' = -2xy$
2. $2(xy + x)y' = y$
3. $ye^{x+y}dy = dx$
4. $2xdx - dy = x(xdy - 2ydx) \quad y(-3) = 1$
5. $(x^2 + y^2)dx = 2xydy$
6. $(xy + y^2)dx = (x^2 + xy + y^2)dy$
7. $x^2dy = (xy - y^2)dx$
8. $(2xy + x^2)dx + (x^2 + y^2)dy = 0$
9. $(siny - ysinxy)dx + (xcosy - xsinxy)dy = 0$
10. $(x^2 - y^2)y' + (2xy + 1) = 0$
11. $(5x^2 + 1)y' - (20xy) = 10x \quad y(0) = \frac{1}{2}$
12. $y' + y = e^{-x} \quad y(0) = 3$
13. $(x^2 + 1)dy = (x^3 - 2xy + x)dx \quad y(1) = 1$
14. $y' + 2xy - x = e^{-x^2}$
15. $yy' + xy^2 - x = 0 \quad y(0) = -1$
16. $ydy = (x - y^2)dx$

2nd order differential equations

1. $(D^2 + 3D + 2)y = \frac{-e^{-x}}{x} + x^2$
2. $(D^2 + D)y = cos^2x + sin^2xx^2$
3. $y^{//} - 2y^{/} + 2y = e^{-x}cosx$
4. $y^{//} + 4y^{/} + 3y = x - 1$
5. $y^{//} - 5y^{/} + 6y = coshx$
6. $y^{//} + y^{/} = sinx + 2cos2x$
7. $y^{//} + 5y^{/} + 6y = 3e^{-2x} + 4x^2$
8. $(D^2 - 2D + 1)y = xlnx$

Higher order differential equations

1. $(D + 2)(D^2 + 2D + 2)y = x - sinx$
2. $(D^3 + D)y = 4cos2x$
3. $(D^4 - 16)y = e^x$
4. $(D^3 + D^2 + 3D - 5)y = e^x$
5. $(D + 1)^4y = e^x + 12$
6. $(D^2 + 1)(D^2 + 5)y = e^x$