

Review for Final

- i) Solve the following differential equations
- a) $y' = xy^3$
 - b) $y' = 4x^3y - y, y(1) = -3$
 - c) $2xy' - 3y = 9x^3$
 - d) $x^2y' = xy + x^2e^{y/x}$
 - e) $(1 + ye^{xy})dx + (2y + xe^{xy})dy = 0$
 - f) $x^2y'' + 3xy' = 2$
 - g) $2y''' - 3y'' - 2y' = 0; y(0) = 1, y'(0) = -1, y''(0) = 3$
 - h) $y'' + 4y = 2x; y(0) = 1, y'(0) = 2$
 - i) $y'' - 4y' + 4y = 2e^{2x}$
- ii) Find all eigenvalues of $y'' + \lambda y = 0; y'(-\pi) = 0, y'(\pi) = 0$
- iii) Transform $x^{(4)} + 6x'' - 3x' + x = \cos(3t)$ into a system of first-order differential equations.
- iv) Solve the system of differential equations $x' = 8y, y' = -2x$
- v) Word Problems : Section 1.2 Problem 25, Section 1.4 Problems 33, 37, 39, Section 1.5 Problem 33
- vi) Find the Laplace transform of
- a) Section 7.1 Problem 9
 - b) $\sin(3t) \cos(3t)$
 - c) $t^{3/2}e^{-4t}$
 - d) $t^2 \cos(2t)$
 - e) Section 7.5 Problem 25
- vii) Find the inverse Laplace Transform of
- a) $s^{-3/2}$
 - b) $(s + 2)/(s^2 + 4s + 5)$
 - c) $1/(s^4 - 16)$
 - d) $1/(s(s - 3))$
 - e) $\ln(s^2 + 1)/(s^2 + 4)$
- viii) Solve the following differential equations using Laplace transforms
- a) $x'' + 9x = 0; x(0) = 3, x'(0) = 4$
 - b) $tx'' + (t - 2)x' + x = 0; x(0) = 0$
 - c) $x'' + 5x' + 4x = f(t)$ where $f(t) = 1$ for $0 \leq t < 2$ and $f(t) = 0$ if $t \geq 2$
- ix) Find a power series solution of
- a) $(x^2 + 1)y'' + 6xy' + 4y = 0$
 - b) $y'' + x^2y' + 2xy = 0$
- x) Section 8.3 Problems 1, 3, 5, 8, 17, 21