

MATHEMATICS FOR AERO/MECHANICAL ENGINEERS

TUTORIAL SHEET 3

ORDINARY DIFFERENTIAL EQUATIONS III

1. Find the solutions to the following initial value problems:

(i) $\frac{dP}{dt} = 0.02P, P(0) = 20$

(ii) $\frac{dQ}{dt} = \frac{Q}{5}, Q = 50$ when $t = 0$

(iii) $\frac{dP}{dt} = P + 4, P = 100$, when $t = 0$

(iv) $\frac{dB}{dt} + 2B = 50, B(1) = 100$

(v) $\frac{dH}{dt} = -k(H - 20), H(0) = 37$

(vi) $\frac{dy}{dx} = 100 - y, y(0) = 0$ (vi)

2. Find the solutions of the following differential equations:

(i) $\frac{dy}{dx} + y = 2, y(0) = 0$

(ii) $\frac{dy}{dx} - 2y = 3e^{2x}, y(0) = 0;$

(iii) $x \frac{dy}{dx} + 2y = 3x, y(1) = 5$

(iv) $\frac{dy}{dx} + 2xy = x, y(0) = -2$

3. Find the solutions to the following differential equations:

(i) $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 5y = 0; \quad y(0) = 1, y'(0) = 0$

(ii) $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 5y = 0; \quad y(0) = 5, y'(0) = 5$

(iii) $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 10y = 0; \quad y(0) = 0, y'(0) = 2$

(iv) $\frac{d^2y}{dx^2} + 6\frac{dy}{dx} + 10y = 0; \quad y(0) = 0, y'(0) = 0$