CALCULUS
DIFFERENTIAL EQUATIONS, ADDITIONAL EXERCISES NO.7

1. Linear differential equations

(1) Find the solution - and its domain - for the following linear differential equations:

$$y'(x) - \frac{q}{x}y(x) = (r+x)^2, \quad q = 4,\ r = 1,\ y(1) = 0 \tag{1.1}$$

$$y'(x) - \frac{a}{x}y(x) = bx + c, \quad a = 1,\ b = 2,\ c = 3,\ y(1) = 0 \tag{1.2}$$

$$y'(x) - \frac{y(x)}{x} = x^q, \quad q = 2,\ y(1) = 0 \tag{1.3}$$

$$y'(x) - y(x)\tan(x) = x, \quad y(0) = 1 \tag{1.4}$$

$$y'(x) + y(x)\log(x) = e^{x - x\log(x)}, \quad y(1) = 0 \tag{1.5}$$

2. Separable differential equations

(1) Find the solution - and its domain - for the following separable differential equations:

$$y'(x) = \frac{x-5}{y^2}, \quad \text{give general } y(x)^3 \tag{2.1}$$

$$y'(x) = \frac{y-1}{x+3}, \quad y(0) = 0 \tag{2.2}$$

$$y'(x) = \frac{x+3}{y-1}, \quad y(-1) = 4 \tag{2.3}$$

$$y'(x) = xy - ye^x, \quad y(0) = 1 \tag{2.4}$$

$$y'(x) = \frac{xy^2 - 4x}{x^2+4}, \quad \text{give general } y(x) \tag{2.5}$$