Further mathematics for economists

Exercise Sheet 4 - Differential Equations

1. Find the specific solution of the differential equation

$$\frac{dy}{dt} + 2y = 3e^{-t}$$

so that $y = 4$ when $t = 0$

2. Find the general solutions of the following differential equations:

   (a) $x\frac{dy}{dx} - 2y = x^5$

   (b) $(x^2 + 1)\frac{dy}{dx} + xy = 1$

   (please note: you will need to divide and multiply the RHS by $x + \sqrt{x^2 + 1}$ to solve one integral by substitution at the very end)

   (c) $2\frac{dy}{dt} + y + (1 + t)y^3 = 0$

   (note that this is a Bernoulli equation)