Mathematical Methods II
Weekly problem set 1

Solve problems 14.1, 14.2(a), 14.3(a) and 14.3(b) in Ripley, Hobson and Bence, Mathematical Methods for Physics and Engineering. For your convenience these problems are written below:

(14.1) A radioactive isotope decays in such a way that the number of atoms present at a given time, N(t), obeys the equation

$$\frac{dn}{dt} = -\lambda N.$$

If there are initially N_0 atoms present, find $N(t)$ at a later time.

(14.2) Solve the following equation by the separation of variables method

(a) $y' - xy^3 = 0$

(14.3) Show that the following equations either are exact or can be made exact, and solve them:

(a) $y(2x^2y^2 + 1)y' + x(y^4 + 1) = 0$,

(b) $2xy' + 3x + y = 0$,