Linear Differential Equation

Linear Differential Equations:

The equation of the form $A(x)\frac{dy}{dx} + B(x)y = C(x)$ is called a Linear equation of order one.

$$A(x)\frac{dy}{dx} + b(x)y = C(x)$$

$$=> \frac{dy}{dx} + \frac{B(x)}{A(x)}y = \frac{C(x)}{A(x)}$$

$$=> \frac{dy}{dx} + P(x)y = Q(x)$$

Which is the standard form of **Linear DE of order one.**

Working Rules:

1. Put the equation into standard form $\frac{dy}{dx} + P(x)y = Q(x)$
2. Obtain the integrating factor $e^{\int p dx}$
3. Apply the integrating factor to the equation.
4. Solve this equation.

Questions:

Solve the following linear differential equations:

1. $(1+x^2)\frac{dy}{dx} + y = \tan^{-1} x$
2. $x\frac{dy}{dx} - 3y = x^2$ H.W (Ans: $\frac{y}{x^3} = -\frac{1}{x} + c$)
3. $\frac{dy}{dx} + y\tan x = \sec x$

4. $(x^2-1)\frac{dy}{dx}+2xy-1=0$

5. $x\log x\frac{dy}{dx}+y=2\log x$ H.W (Ans: $y\log x=(\log x)^2+c$)

6. $\frac{dy}{dx}+\frac{y}{x}=\frac{y^2}{x^2}$

7. $\frac{dy}{dx}+\frac{x}{1-x^2}=\frac{y^2}{x^2}$