Problem set-7 Hints and Answers

1. a. Ans: order 2, degree 2
   b. Ans: order 4, degree 1
   c. Ans: order 3, degree 10
   d. Ans: order 3, degree 3
   e. Ans: If c=0, then order 1, degree =3
      If $c \neq 0$, then order 2, degree=2

2. a. Ans: $x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} = xy$
   b) Ans:$(1 + (y^{'})^2)^3 = a^2(y^{''})^2$
   c) Ans: $y^{''} = -\cos^{-1}\left(\frac{y-y^{''}}{2}\right)\cos x + \cosh^{-1}\left(\frac{y+y^{''}}{2}\right)\cosh x$
   d) Ans: $y^{''} - 3y^{'} + 2y = 0$
   e) Ans :$(a^2 - b^2)y^{'} = (xy' - y)(x + yy^{'})$
   f) Ans :$(x^2 - y^2)y^{'} = 2xy$

3. a. Ans: $y = 3\cos x - 2\cos^2 x$
   b. Ans: $x + y - 2 = (x - y)^3$

4. a. Ans: $\log x = \cos\frac{y}{x} + C$
   b. Ans: $\log(2x + 2y + 1) + 2x - 6y = C$
   c. Ans: $y^2 + xy - x^2 + 3y + x = K_1$

5. a. Ans: $x^2\cos y + x^3y - \frac{y^2}{2} = C$
   b. Ans: $x^2y + xy - x\tan y + \tan y = C$
   c. Ans: $-\frac{1}{x}\log x - \frac{1}{x} = C + \frac{y}{x}$
   d. Ans :$\frac{x}{y} - 2\log x + 3\log y = C$
   e. Ans :$-\frac{1}{xy} + 2\log x - \log y = K$
   f. Ans :$(x^2 - y^2) = Cx$, (If $\frac{\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}}{N} = f(x)$,a function of x alone,then $e^{\int f(x)}$is an integrating factor of $M(x, y) + N(x, y)dy = 0$)

6. a. Ans: $y = xe^{-x} + C$
   b. Ans: $xe^{\tan^{-1}y} = \tan^{-1}y + C$
   c. Ans: $y^{1-n} = 2\sin x - \frac{2}{1-n} + Ce^{(n-1)\sin x}$
   d. Ans :$\tan y = \frac{1}{2}(x^2 - 1) + Ce^{-x^2}$
   e. Ans :$\frac{1}{y} = Cx + \log x + 1$
   f. Ans:$\tan y = \frac{1}{2}(x^2 - 1) + Ce^{-x^2}$
   g. Ans : $2y^{-5}x^{-5} = -5x^{-2} + C$
   h. Ans :$y^{-2} = x + \frac{1}{2} + Ce^{2x}$