Assignment 1

Section A: Short answer type questions

1. Find n^{th} derivative of $a^x \cos(x)$.
2. Find y_n, if $y = \tan^{-1}\left(\frac{x}{c}\right)$.
3. Find y_n, if $y = x^2 \sin(x)$ at x=0.
4. Find y_n, if $y = e^{ax} \sin^2 x \sin(2x)$.
5. Examine if Rolle's theorem is applicable for $f(x) = \sec(x)$ in $[0,2\pi]$.
6. Expand $\ln(x)$ in powers of $(x-1)$ upto third degree term.
7. Examine if Lagrange's mean value theorem is applicable for $f(x) = \frac{2x-1}{3x-4}$ in [1,2].

Section B: Long answer type questions

1. Expand $4x^2 + 7x + 5$ in powers of $(x-3)$.
2. If $y = \ln\left(x + \sqrt{1+x^2}\right)^2$ prove that $(1+x^2)y_{n+2} + (2n+1)x\, y_{n+1} + n^2 y_n = 0$.
3. If $y = x^{n-1} \log x$, show that $y_n = \frac{(n-1)!}{x}$.
4. Verify Rolle's theorem for following
   i) $x^2 - 6x + 8$ in [2,4];
   ii) $e^x \sin x$ in $[0, \pi]$.