Questions on self learning components

1. Find the nth derivative of $\sin^4 x$
2. Find the nth derivative of $\frac{x^4}{(x-1)(x-2)}$
3. Find the nth derivative of $e^{3x} cosx \sin^2 x$
4. If $y = \tan^{-1} \frac{\sqrt{x^2+1}-1}{x}$, show that $y_n = \frac{1}{2}(-1)^{n-1}(n-1)!\, sinn(\theta) \sin^n(\theta)$
5. If $y\sqrt{(1+x^2)} = \log\left(x+\sqrt{x^2+1}\right)$, prove that $(1+x^2)\, y_{n+2} + (2n+3)\, xy_{n+1} + (n+1)^2\, y_n = 0$
6. If , $y = \cos(m \sin^{-1} x)$ show that $(1-x^2)\, y_{n+2} = (2n+1)\, xy_{n+1} + (n^2 - m^2)\, y_n$. Also find $y_n(0)$.
7. Evaluate $\int_0^{2a} \frac{x^3}{\sqrt{(2ax - x^2)}}\, dx$
8. Evaluate $\int_0^a x^2 (a^2 - x^2)^{3/2}\, dx$
9. Evaluate $\int_0^\infty \frac{x^3}{(a^2+x^2)^5}\, dx$
10. Evaluate $\int_0^{\pi/4} \tan^6 x\, dx$