ENGR122 Assignment 5

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1. Differentiate each of the following functions:
   (a) $y = \sin^2(5 + x)$
   (b) $y = e^{2 \sin x}$
   (c) $y = (4x + 7)^5$
   (d) $y = e^{-x} \cos 5x$
   (e) $y = \ln \cos 4x$
   (f) $y = \frac{1}{x^2+1}$
   (g) $y = \frac{x^3 \sin 2x}{\cos x}$
   (h) $y = x^3 e^{-x} \tan x$
   (i) $y = \frac{xe^{5x}}{\sin x}$
2. If $x = \frac{5+3t}{1-t}$ and $y = \frac{2-t}{1-t}$ find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.
3. Locate the position of the turning points of the following functions and determine whether they are maxima or minima.
   (a) $y = x^2 - x + 6$
   (b) $y = x - 1$
   (c) $y = x^3 - 12x$
4. Locate the maximum points, minimum points and points of inflexion of
   (a) $y = 3t^2 + 6t - 1$
   (b) $y = 4 - t - t^2$
   (c) $y = x^5 - \frac{5x^3}{3}$
   (d) $y = x^2 \ln x$
5. (a) Calculate the first-order Taylor polynomial $p_1(x)$ generated by $y = e^x$ about $x = 0$ and $x = 1$.
   (b) In each case find the values $p_1(0.1)$ and $y(0.1)$.
   (c) What do you observe?
6. (a) Obtain the second-order Taylor polynomial $p_2(x)$, generated by $y = 3x^4 + 1$ about $x = 2$
   (b) Evaluate $p_2(1.8)$ and $y(1.8)$
7. Given $y(x) = \sin(x)$, obtain the third-, fourth-, and fifth-order Taylor polynomials generated by $y(x)$ about $x = 0$.

The marks are 18,12,12,16,15,12,15 for questions 1-10. Total is 100.