Homework 7

Practice Exercises from the Textbook

- §3.10: 3, 23, 31, 43

- Notes §1 : 1, 2, 3, 5

- Notes §2 : 1, 2, 3

Exercises Due Thursday 3rd November at the beginning of class :

- §3.10 : 2, 6, 26, 28

- Notes §1 : 4

- Notes §2 : 2

Exercise 1.
Suppose that we know that $f(1) = f'(1) = 1$ and let $g(x) = f(x^3)$. Use a linear approximation of $g(x)$ (and *not* a linear approximation of $f(x)$) to estimate $g(1.1)$.

Exercise 2.
Remark : "Maclaurin polynomial" is a synonym for "Taylor polynomial around 0" (or with $a = 0$).

a) Find the fourth degree Maclaurin polymonial of e^{3x^2}.

b) Write the first three non-zero terms of the Maclaurin polynomial for $f(x) = x\sin(-2x)$.

c) If we expand $\sin^2(x)$ in a Maclaurin polynomial, ie. $\sin^2(x) = c_0 + c_1 x + c_2 x^2 + \ldots$, find c_6.   Hint : $\sin^2(x) = (1 - \cos(2x))/2$.

d) Compute $f^{(9)}(0)$ for $f(x) = x\cos(x^2)$.

e) Compute $\lim\limits_{x \to 0} \dfrac{x + \cos(2x) - e^x}{x^2}$.   Hint : Use Taylor polynomials.

Exercise 3.

a) A function $f(x)$ has third derivative equal to $10/(1 - x)$. The second-degree Taylor polynomial $T_2(x)$ at $a = 0$ is used to approximate $f(0.1)$. Find the upper bound for the error given this polynomial, ie. find the upper bound of $|f(0.1) - T_2(0.1)|$.

b) Using a linear approximation, approximate $\sqrt{100.2}$.

c) Find the upper bound of the absolute value of the error made at the previous question.

d) Find the upper bound of the absolute value of the error made by the Maclaurin polynomial of degree two $T_2(x)$ used to estimate $f(1)$ with $f(x) = e^x(x^2 - 7x + 15)$.   Note : the simplest I think is to directly use the formula for the error of a Taylor polynomial.

Directions concerning the page setup for assignments :

- On the top of the first page write clearly and in this order your
  Last Name :   First Name :   Student Number :

- The title ("Homework 7")

- The title of every exercise and clearly separate the exercises

- Staple the sheets together

Remember that there are marks for presentation and explanations, just a bunch of numbers or equations won't give you full mark.