Homework Assignment for Chap 03

Last update Sep 21, 2012.

1. Section 3.1: problems 40, 49.
2. Section 3.2: problems 17, 21, 25, 27, 33, 37, 57, 67.
3. Read section 3.3: definition for average rate of change (velocity) and instant rate of change (velocity).
4. Section 3.4: problems 15, 19, 27, 53.
5. Section 3.5: problems 13, 21, 23, 29, 39. As time permits, pick among problems 51-70 and practice until you are fluent with differentiation.
6. $\frac{d}{dx}(f_1(x)f_2(x)\cdots f_n(x)) =?$
   $\frac{d^n}{dx^n}(f(x)g(x)) =?$
7. Show (and memorize) that

$$\begin{aligned}\frac{d}{dx}\begin{vmatrix} f(x) & g(x) \\ h(x) & k(x) \end{vmatrix} &= \begin{vmatrix} f'(x) & g(x) \\ h'(x) & k(x) \end{vmatrix} + \begin{vmatrix} f(x) & g'(x) \\ h(x) & k'(x) \end{vmatrix} \\ &= \begin{vmatrix} f'(x) & g'(x) \\ h(x) & k(x) \end{vmatrix} + \begin{vmatrix} f(x) & g(x) \\ h'(x) & k'(x) \end{vmatrix}\end{aligned}$$

   using product rule. What is the corresponding formula for a 3 by 3 determinant? How about 4 by 4, etc?
8. Section 3.6: problems 21, 25, 33, 37, 43, 58.
9. The error formula for linear approximation is not mentioned explicitly in the textbook (not until Chap 9, Taylors Theorem). Just memorize it for now:

$$f(x) - L(x, x_0) = \frac{1}{2}f''(\xi)(x - x_0)^2$$

   where ξ lies between x and x_0. As a consequence, we have an error bound

$$|f(x) - L(x, x_0)| \le \frac{1}{2}\left(\max_{\xi \text{ between } x \text{ and } x_0} |f''(\xi)|\right)(x - x_0)^2$$

10. Section 3.7: problems 9, 10, 17, 20 (also give an error estimate for (b)), 35, 45, 51.
11. Review equations (10), (11) in section 3.7 (page 184). Try to derive them. Then read Appendix 3 (proof of chain rule).

12. Section 3.8: problems 11, 13, 22. Just write the formula of Newton's iteration. Need not get the numerical values for problems 13, 22.

13. Section 3.8: Read problem 24.

    Also read page 190 about the limitation of Newton's method. (i.e. When does it work and not work?)

14. Chap 3: problem 90. Do the same for $\frac{1}{1+\sin(2x)}$.