Homework Assignment for Chapter 03

1. Section 3.2: problems 17, 54, 57, 48.
2. Section 3.3: problems 47, 55, 67, 70.
3. $\frac{d^n}{dx^n}(f(x)g(x)) =$? Try $n = 2, 3, \cdots$ and conclude the general formula. Memorize the result.
4. Use product rule to show (and memorize) that

$$\frac{d}{dx}\begin{vmatrix} f_{11}(x) & f_{12}(x) \\ f_{21}(x) & f_{22}(x) \end{vmatrix} = \begin{vmatrix} f'_{11}(x) & f_{12}(x) \\ f'_{21}(x) & f_{22}(x) \end{vmatrix} + \begin{vmatrix} f_{11}(x) & f'_{12}(x) \\ f_{21}(x) & f'_{22}(x) \end{vmatrix}$$
$$= \begin{vmatrix} f'_{11}(x) & f'_{12}(x) \\ f_{21}(x) & f_{22}(x) \end{vmatrix} + \begin{vmatrix} f_{11}(x) & f_{12}(x) \\ f'_{21}(x) & f'_{22}(x) \end{vmatrix}$$

   What is the corresponding formula for a 3 by 3 determinant? How about 4 by 4, etc?
5. Section 3.5: problems 17, 49, 57, 58.
6. Section 3.6: Do as many as time permits from problems 51, 53, $\cdots$, 77.
7. Assume $g(2) = 3$, $g'(2) = 0.1$, $f'(2) = 3$, $f'(3) = 4$ and $f'(4) = 5$. What is $\frac{d}{dx}f(g(x))$ at $x = 2$?
8. Section 3.7: problems 27, 31, 42, 48.
9. Section 3.8: problems 7, 9, 37, 39, 51 (Hint: take ln on both sides first), 65, 77, 89, 91, 98. 93, 95.
10. Section 3.9: problems 21, 23, 25, 33, 35, 39, 55.
11. Start with domain and range for csc and $\csc^{-1}$, derive the formula for the derivative of $\csc^{-1}$.
12. Section 3.11: problems 9, 11, 17, 63, 64.
13. The error formula for linear approximation $L(x, x_0)$ (also denoted as $L(x)$ sometimes) is not mentioned explicitly in the textbook till a later Chapter. Just take it for granted and memorize it for now:

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

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

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

   Use this formula to give an estimate on the error of linear approximation for problem 17 (b) of Section 3.11.