每題 10 分

1. Find (a) $\lim\limits_{x \to 0} \dfrac{|x|}{x}$　(b) $\lim\limits_{x \to 4} \dfrac{\sqrt{x}-2}{x-4}$

2. Find (a) $\dfrac{d}{dx}(2x^2 + \cos x + 3)$　(b) $\dfrac{d}{dx}\exp(x^2)$

3. Find the equation of the <u>tangent line (切線)</u> to $x^3 + y^3 = 6xy$ at (3,3)

4. Let $f(x) = x^4 - 4x^3$. Find all <u>possible(可能的)</u> <u>relative extreme points(相對極點)</u>, and <u>inflection points(反曲點)</u>, and <u>plot the graph(畫圖)</u>.

5. Find (a) $\int \left(\dfrac{1}{x} + 3^x + \cos x \right) dx$　(b) $\int_0^1 x^2 e^{x^3}\, dx$

6. Find f_x, f_{xy} and the <u>gradient(梯度)</u> vector of $f(x,y) = x^3 + x^2 y^3 - 2y^2$

7. Find $\partial z / \partial s$ if $z = e^x \sin y$, $x = st^2$, $y = s^3 t$.

8. Use Lagrange multiplier to find the <u>extreme value(極值)</u> of $f(x,y) = 3x + 4y$ on $x^2 + y^2 = 1$.

9. Find the <u>interval of convergence(收斂區間)</u> of $\sum\limits_{n=1}^{\infty} (-1)^n \dfrac{(3x)^n}{n}$

10. <u>Reverse(反轉)</u> integration <u>order(次序)</u> to evaluate $\int_0^4 \int_{x/2}^2 \exp(y^2)\, dy\, dx$.