1. (10%) Find the limits　(需寫過程)

    (a) $\lim\limits_{x \to 5} \dfrac{5-x}{x^2-25}$　　　　　(b) $\lim\limits_{x \to 0} \dfrac{\sin 2x}{3x}$

2. (10%) Find y'

    (a) $y = \int_0^{2x} \sqrt{1+e^t}\, dt$　　　　(b) $y = (x^2+1)^{99}$

3. (10%) Find y' by implicit differentiation $x^3 y^2 - 2x^2 y + 2x = 3$.

4. (10%) Find the absolute maximum and absolute minimum of the function
   $f(x) = 3x^4 - 4x^3 - 8$ on $[-1,2]$.

5. (10%) Find $\int \sqrt{x+1}\, dx$.

6. (10%) Find $\int t e^t\, dt$.

7. (10%) Find $\int \dfrac{\sqrt{\ln x}}{x}\, dx$.

8. (10%) Find the interval of convergence of the power series $\sum_{n=0}^{+\infty} \dfrac{2^n x^n}{3n+1}$.

9. (10%) $\int_0^1 \int_0^2 x + y\, dx\, dy$.

10. (10%) Find the directional derivative of $f(x,y) = x^2 - 2y$ at the point $(1,-2)$ in the
    direction from $P(-1,2)$ to $Q(2,3)$.