大同大學 105 學年度第 1 學期期中考試試題

科目代號:**G1011** 科目名稱: 微積分 (一) 班級:　　　座號:　　姓名:
註: 本次考試**不可**參考自己的書籍、筆記。**不可**用計算機、電子辭典。

1. Find the limits.

   (5%)(a.) $\lim\limits_{x \to 0} \dfrac{\sin^2(5x)}{x^2}$.

   (5%)(b.) $\lim\limits_{x \to -2} \dfrac{\sqrt{x+6}-2}{x+2}$.

   (5%)(c.) $\lim\limits_{x \to 3^+} \dfrac{x^2+5x+6}{x^2-9}$.

   (5%)(d.) $\lim\limits_{x \to 5^-} ([x] + 2\sqrt{5-[x]})$, $[x]$爲高斯函數.

2. Find the derivative y' of the followings.

   (5%)(a.) $y = 3\sqrt[3]{x} - \dfrac{3}{\sqrt{x}} + \dfrac{2}{x^2}$.

   (5%)(b.) $y = x^3 e^x \sin x$,

   (5%)(c.) $y = (2x^3 + 3x^2 + x)^{10}$.

   (5%)(d.) $y = \dfrac{x^2-5}{x^5+2x}$ (use the Quotient Rule).

   (5%)(e.) $y = \tan^2 x$.

   (5%)(f.) $y = \ln|3x+1|$

3. (5%) Find an equation of the tangent line to the graph of $f(x) = 3x + \sqrt[3]{x^2} - 2$ when $x = -1$.

4. (5%) Find the maximum and minimum of $f(x) = x^4 - \frac{1}{2}x - 1$ on the interval $[0, 1]$.

5. (10%) Let $f(x) = \left(1 - 9x^2\right)^{\frac{2}{3}}$.
   (a.) Find the relative extrema of $f(x)$.
   (b.) Determine the open intervals on which $f(x)$ is increasing or decreasing.

6. (10%) Let $f(x) = -3x^5 + 40x^3$.
   (a.) Find the points of inflection(反曲點).
   (b.) Determine the open intervals on which the graph of $f(x)$ is concave upward or concave downward.

7. Find $\frac{dy}{dx}$ of the followings.

   (10%)(a.) $y = (3x)^{2x}$.

   (10%)(b.) $e^{x+y} = y^2 + \sqrt{\dfrac{x}{y}}$.