大同大學 107 學年度第 1 學期期末考試試題

科目代號:**XXXX** 科目名稱: 微積分 (一) 班級: **XXXX** 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. (10%) Let $f(x) = \left(9 - x^2\right)^{2/3}$.
   (a) Find the relative extrema(相對極值) of $f(x)$.
   (b) Determine the open intervals on which $f(x)$ is increasing(遞增的) or decreasing(遞減的).

2. (10%) Let $f(x) = e^{-\frac{1}{2}(x-1)^2}$.
   (a) Determine the open intervals on which the graph of $f(x)$ is concave upward(凹口向上) or concave downward(凹口向下).
   (b) Find the points of inflection(反曲點).

3. (10%) Find the following limits:

   (a) $\lim_{x\to 0^+}(1+2x)^{2/x}$ (b) $\lim_{x\to 0}\dfrac{6e^{3x} - 6 - 18x - 27x^2}{4x^3}$

4. Find the integral.

   (10%)(a) $\displaystyle\int \frac{8x^3 + \sqrt{x} - 5}{x\sqrt{x}}\,dx$ (10%)(b) $\displaystyle\int \frac{2x^3 + 4x}{\sqrt[5]{x^4 + 4x^2 + e^8}}\,dx$

5. Find the integral.

   (10%)(a) $\displaystyle\int x^5 \ln x\,dx$ (10%)(b) $\displaystyle\int \sin^{95}(3x)\cos^3(3x)\,dx$

6. (10%) Evaluate the integral.

   $$\int_{-\pi/4}^{\pi/4} e^{-4x}\sin(2x)\,dx$$

7. (10%) Let $F(x) = \displaystyle\int_{x^3}^{x^2}\left(t^2 + \frac{2}{(4+t^2)^3}\right)dt$, find $F'(x)$.

8. (10%) Solve the differential equation:

   $$\frac{dy}{dx} = \frac{3-x}{x^2 + 4x + 7}$$