微積分聯合教學　　九八暑期 週考五　　**Aug 11, 2009**

考試時間 50 分鐘，滿分 50 分。請在考試卷上以中文或英文盡量依序作答，請詳列計算過程，否則不予計分。需標明題號但不必抄題。考試卷務必寫學號、姓名，試題不必繳回。

1. (*5* points) In the following figure, which of (A), (B), (C) is *not* the graph of an anti-derivative of $f(x)$? Explain.

2. (*5* points) Solve the differential equation $\dfrac{dy}{dx} = \cos 5x$ with the initial condition $y(\pi) = 3$.

3. (*5* points) Find the formula for the *right Riemann sum R_N* for $f(x) = x^3$ in the interval $[0, 1]$. (不必求其極限)

4. (*5* points) Calculate the integral

$$\int_{-2}^{2} |x^2 - 1|\, dx$$

5. (*10* points) Show that the area of a parabolic arch (the shaded region in the following figure) is euqal to four-thirds the area of the triangle shown.

(背面還有)

6. (*10* points) Let

$$A(x) = \int_0^x f(t)\, dt$$

with $f(x)$ as in the figure.

(a) Does $A(x)$ have a local maximum at P?

(b) Where does $A(x)$ have a local minimum?

(c) Where does $A(x)$ have a local maximum?

(d) True or false: $A(x) < 0$ for all x in the interval shown? Explain.

7. (*10* points) The following figure shows the migration rate (移民率) $M(t)$ of Ireland (愛爾蘭) during the period 1988–1998. This is the rate at which people (in thousands per year) move in or out of the country (移入是正數，移出是負數).

(a) What does

$$\int_{1988}^{1991} M(t)\, dt$$

represent?

(b) Did migration over the 11-year period 1988–1998 result in a net influx (流入) or outflow (流出) of people from Ireland? Explain.

(c) During which year could the Irish prime minister (愛爾蘭首相) announce: "We are still losing population but we've hit an inflection point—the trend is now improving."