國立聯合大學 106 學年度

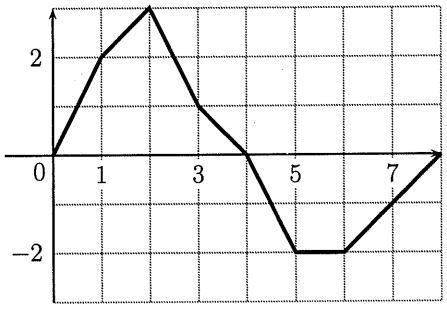
寒假轉學生招生考試試題紙

科目：微積分　第 1 頁共 2 頁

一. 簡答題 (1-10 每題 3 分，11-15 每題 4 分)

說明：答案必須寫在「答案卷」上，並標明題，但無須寫出演算過程。

1. Find y' if $y = x^3 \cos x$.
2. Find $g'(x)$ if $g(x) = \tan^{-1} x^2$.
3. Find $\int x^2 e^{x^3}\, dx$.
4. Find $\int_1^2 \frac{d}{dx}(e^{x^2})\, dx$.
5. Find $\frac{d}{dx}\int_1^x \sin(t^2)\, dt$.
6. Find $\frac{d}{dx}\int_1^2 e^{\tan^{-1} x}\, dx$.
7. Find $\frac{dy}{dx}$ if $x^3 + 2xy + y^2 = 5$.
8. Find $f_x(x, y)$ if $f(x, y) = x^y$.
9. Find $f_y(x, y)$ if $f(x, y) = x^y$.
10. The graph of f is shown. Find $\int_1^7 f(x)\, dx$.



11. Find $f'(x)$ if $f(x) = \frac{1 + 2x}{3 - 4x}$.
12. Suppose $f_x(0, 2) = 3$, $f_y(0, 2) = 1$, $x = 2u - v$ and $y = u^2 v$. Find $\frac{\partial f}{\partial u}$ when $u = 1$, $v = 2$
13. Suppose $f(x, y) = x^2 y$. Find $\nabla f(1, 2)$.
14. Suppopse $f_x(2, 1) = 2$, $f_y(2, 1) = -3$ and $\mathbf{u} = \frac{4}{5}\mathbf{i} + \frac{3}{5}\mathbf{j}$. Find $D_{\mathbf{u}} f(2, 1)$.
15. Find $\iint_R (6x^2 y - 2x)\, dA$, $R = [1, 4] \times [0, 2]$

二. 計算題 (16-25 每題 5 分)

說明：答案必須寫在「答案卷」上，並標明題號，同時必須寫出演算過程或理由。

16. Find $\int x \sin 3x \, dx$.

17. Find $\int \frac{3x^2 + x + 1}{x(x^2 + 1)} \, dx$.

18. Find the absolute maximum and minimum values of the function

$$f(x) = 2x^3 - 3x^2 - 12x + 1, \quad [-2, 3]$$

19. Find the maximum rate change of $f(x, y) = xe^y$ at the point $P(2, 0)$ and the direction in which it occurs.

20. Find $\int_0^1 \int_x^1 e^{y^2} \, dy \, dx$.

21. Find the derivative of the function $f(x) = \pi$ using the definition of derivative.

22. Find the Taylor polynomial $T_6(x)$ for the function $f(x) = \cos x$ at π.

23. Find $\lim_{n \to \infty} \sum_{i=1}^{n} \sin\left(\frac{\pi}{n} i\right) \frac{\pi}{n}$.

24. Find $\int_1^4 \frac{4 + 6x}{\sqrt{x}} \, dx$.

25. Find $\lim_{x \to 0} \frac{x^2}{1 - \cos x}$.