

國立聯合大學 105 學年度碩士班考試招生

環境與安全衛生工程系

入學考試試題

科目： 微積分 第 1 頁共 1 頁

一、單選題(每題5分)

1. The graph of f is shown in the Figure 1. Estimate $\int_0^8 f(x)dx =$
 (A) 0 (B) 1 (C) 2 (D) -1 (E) -2
2. (續上題) Let $g(x) = \int_0^x f(t)dt$, Find $g'(6) =$
 (A) -3 (B) -2 (C) -1 (D) 0 (E) 3
3. (續上題) At what value of x does $g(x)$ have a local maximum value on $[0,8]$?
 (A) $x = 0$ (B) $x = 2$ (C) $x = 4$ (D) $x = 5$, $x = 6$ (E) $x = 7$

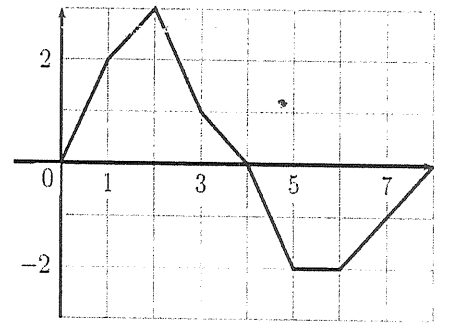


Figure 1.

Figure 2 shows the graph of a function f . 依圖2，判別題4~題7所敘述的正誤，正確請寫(A)，錯誤請寫(B)：

4. $\lim_{x \rightarrow 0} f(x)$ does not exist.
5. $\lim_{x \rightarrow 0} \frac{1}{f(x)} = \infty$

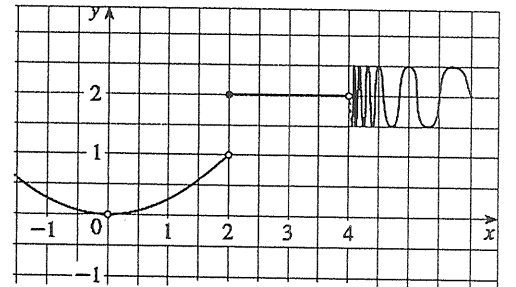


Figure 2.

6. Choose the correct form of the partial fraction decomposition of the rational function $\frac{x^2-2x-1}{(x-1)^2(x^2+1)}$. (where a, b, c and d are constants)
 (A) $\frac{a}{(x-1)^2} + \frac{b}{x^2+1}$ (B) $\frac{a}{(x-1)^2} + \frac{bx+c}{x^2+1}$ (C) $\frac{ax+b}{(x-1)} + \frac{cx+d}{x^2+1}$ (D) $\frac{a}{(x-1)} + \frac{b}{(x-1)^2} + \frac{cx+d}{x^2+1}$ (E) $\frac{a}{(x-1)} + \frac{bx+c}{(x-1)^2} + \frac{d}{x^2+1}$
7. $\int_0^1 \frac{3x^2+2x+1}{x^3+x^2+x+1} dx = ?$ (A) $2 \ln 4 + \tan^{-1} 2$ (B) 0 (C) $\ln 4$ (D) $2 \ln 2$ (E) $\tan^{-1} 2$
8. If $E = [0, 1] \times [0, 1] \times [0, 1]$, then $\iiint_E (x^2 + y^2 + z^2) dV =$ (A) 5 (B) 4 (C) 3 (D) 2 (E) 1
9. If $f(x) = 6x^2 + 3 - e^x$, then $f'(0) =$ (A) 12 (B) $3 + e^x$ (C) 0 (D) $-e^x$ (E) -1
10. Given $\int_{-2}^8 f(t)dt = 7$ and $\int_{-2}^1 f(t)dt = 2$, find $\int_1^8 f(t)dt =$ (A) -9 (B) -5 (C) 4 (D) 5 (E) 9

二、計算下列各題(答案必須化為最簡型式)：

1. (10分) If $y(x) = (3x^4 + 1)(2x^2 - 5x)$, then $y' = ?$
2. (10分) If $f(x) = \ln(5x^2 - 2x - 2)$, then $f'(1) = ?$
3. (10分) Suppose that $f(5) = 1$, $f'(5) = 6$, $g(5) = -3$, and $g'(5) = 2$. Find the following value :
 (a) $(fg)'(5) = ?$ (b) $(\frac{f}{g})'(5) = ?$ (c) $(\frac{g}{f})'(5) = ?$ (d) $(f+3g)'(5) = ?$ (e) $(\frac{3f}{g})'(5) = ?$
4. (10分) Find $\int_1^2 \frac{3x^{\frac{5}{2}} - 2x^{\frac{3}{2}}}{\frac{1}{x^2}} dx = ?$
5. (10分) Let $z = x \sin(\frac{x}{y})$, find (a) $\frac{\partial z}{\partial x} = ?$ (b) $\frac{\partial z}{\partial y} = ?$
6. (10分) $f(y) = \frac{y-2}{y+2}$, find (a) $\frac{df}{dy} = ?$ (b) $\frac{d^2f}{dy^2} = ?$
7. (20分) The region R is shown as Figure 3. Evaluate $\iint_D (x+y) dA = ?$
8. (30分) Find (a) $\int (6x^2 - 4e^{3x} + \frac{4}{x}) dx = ?$; (b) $\int e^x \cos \pi x dx = ?$ (c) $\int_0^\pi x^3 \sin x dx = ?$
9. (20分) Find (a) $\int_0^2 \int_0^4 y^3 e^{2x} dy dx = ?$ (10分); (b) $\int_0^{\frac{\pi}{4}} \int_0^{\sqrt{2}} (r \cos \theta + r \sin \theta) r dr d\theta = ?$
10. (20分) $w = x^2 y^3; x = 3u + v; y = u - v$ Find the following : (a) $w_x; w_y$ (b) $\frac{\partial w}{\partial u}; \frac{\partial w}{\partial v}$

