

國立高雄師範大學 115 學年度暑假轉學生招生考試試題

系所別：電機工程學系二年級

科 目：微積分（全二頁）

- ※注意：1. 不必抄題，作答時請標註試題題號並依照順序寫在答案卷上，於本試題上作答者，不予計分。
2. 限用藍色或黑色之筆作答，以其他顏色作答者不予計分。
3. 本考試不可使用電子計算器。

一、選擇題（【不需要】列出計算過程，只需要回答選項）（每題 4 分）

- 1 Evaluate the limit: $\lim_{x \rightarrow 2} \left(\frac{1}{x-2} - \frac{1}{x^2-3x+2} \right)$.
(A) -1 (B) -1/2 (C) 1/2 (D) 1 (E) None of the above
- 2 Let $f(x) = \frac{x^2+3x-1}{2x+1}$. What is the value of $f'(2)$?
(A) 17/25 (B) 9/25 (C) 11/25 (D) 13/25 (E) None of the above
- 3 Let $g(\theta) = e^\theta(\tan \theta - \theta)$, and the value of $g'(\pi/4)$ is $ke^{\pi/4}$. What is the value of k ?
(A) $\left(1 - \frac{\pi}{4}\right)$ (B) $\left(2 - \frac{\pi}{4}\right)$ (C) $\left(3 - \frac{\pi}{4}\right)$ (D) $\left(2 + \frac{\pi}{4}\right)$ (E) None of the above
- 4 Let $f(x) = \log_{10}(a + \sin x)$. If $f'(0) = \frac{1}{3 \ln 10}$, what is the value of a ?
(A) 1 (B) 2 (C) 3 (D) 4 (E) None of the above
- 5 Find the sum of all critical numbers of $f(x) = (x-2)^{2/3}(7-x)$.
(A) 4 (B) 5 (C) 6 (D) 7 (E) None of the above
- 6 Let $\lim_{x \rightarrow \infty} \frac{\ln x}{x^k} = 0$. Which of the following values of k satisfies the statement?
(A) -1 (B) 0 (C) $\frac{1}{2}$ (D) All of the above (E) None of the above
- 7 A rectangle is inscribed under the parabola $y = 12 - x^2$ and above the x-axis. What is the maximum possible area of the rectangle?
(A) 16 (B) 24 (C) 32 (D) 48 (E) None of the above

（後面尚有試題）

- 8 $f(x) = x^2 - 4$. If the first iteration gives $x_1 = 2.5$, what was the initial guess x_0 ?
 (A) 3 (B) 4 (C) 5 (D) 6 (E) None of the above
- 9 If $F(a) = \int_0^a (x-1)e^{(x-1)^2} dx$, find $F(2) - F(1)$.
 (A) $\frac{e-1}{2}$ (B) $\frac{e}{2}$ (C) $\frac{e^2-1}{2}$ (D) $e-1$ (E) None of the above
- 10 A particle moves along a line with velocity $v(t)$. What is the difference between $\int_a^b v(t) dt$ and $\int_a^b |v(t)| dt$?
 (A) They are always equal.
 (B) The first represents displacement, while the second represents total distance traveled.
 (C) The first represents total distance traveled, while the second represents displacement.
 (D) Both represent acceleration.
 (E) None of the above

二、計算題（【必須】列出計算過程，依照解題過程完整性與正確性給分）

- 1 Given the curve $x^2 + xy + y^2 = 7$.
 (1) Find $\frac{dy}{dx}$. (5 分)
 (2) Let the equation of the tangent line at the point $(1,2)$ be $ax + by = c$. Find the value of $a + b + c$. (5 分)
- 2 Let C be the curve of intersection of the parabolic cylinder $x^2 = 2y$ and the surface $3z = xy$. Find the exact length of C from the origin to the point $(6, 18, 36)$. (15 分)
- 3 Evaluate $\int_0^{1/2} \int_{\sqrt{3}y}^{\sqrt{1-y^2}} xy^2 dx dy$ (10 分)
- 4 Use the change of variables formula and an appropriate transformation to evaluate $\iint_R xy dA$, where R is the square with vertices $(0, 0)$, $(1, 1)$, $(2, 0)$, and $(1, -1)$. (15 分)
- 5 Use the Divergence Theorem to evaluate $\iint_S (2x + 2y + z^2) dS$, where S is the sphere $x^2 + y^2 + z^2 = 1$. (10 分)

（試題結束）