

系所組別：會計學系乙組、財務金融研究所

考試科目：微積分

考試日期：0308，節次：3

※ 考生請注意：本試題 可 不可 使用計算機

一、選擇題 50 分(每題五分)

1. $\lim_{x \rightarrow 0^+} \left(\frac{|x|}{x} + x \right) =$ (a) 0 (b) 1 (c) $+\infty$ (d) do not exist

2. Find $\frac{dy}{dx}$ given that x and y are related by the equation

$$x^2 y^3 + 6x^2 = y + 12 \text{ and that } y = 2 \text{ when } x = 1. \text{ (a) } \frac{28}{11} \text{ (b) } -\frac{28}{11} \text{ (c) } \frac{11}{28} \text{ (d) } -\frac{11}{28}$$

3. $\lim_{x \rightarrow 0} \frac{4 - 4 \cos x - 2 \sin^2 x}{x^4} =$ (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

4. $\int_{-\frac{1}{\sqrt{2}}}^{\frac{1}{\sqrt{2}}} (1 - 2x^2)(1 - x^2)^{-\frac{1}{2}} dx =$ (a) 0 (b) 1 (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

5. If $y > 0$, then $\int_0^{\infty} \frac{\sin yx}{x} dx =$ (a) π (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{\sqrt{2}}$ (d) $\frac{1}{2}$

6. $\int \sqrt{a^2 - x^2} dx =$

(a) $\frac{1}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{x}{a} \right)$

(b) $\frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{x}{a} \right)$

(c) $\frac{1}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \cos^{-1} \left(\frac{x}{a} \right)$

(d) $\frac{x}{2} \sqrt{a^2 - x^2} + \frac{a}{2} \cos^{-1} \left(\frac{x}{a} \right)$

7. If N is positive integer then $\int_0^{\infty} e^{-x} x^n dx =$ (a) e^n ($n \in N$) (b) $n! e^n$ ($n \in N$)

(c) $n!$ ($n \in N$) (d) n ($n \in N$)

8. Evaluate $\int_1^2 \frac{1}{x} \ln x dx =$ (a) $\ln 2$ (b) $\frac{1}{2} \ln 2$ (c) $\frac{1}{2} (\ln 2)^2$ (d) $\frac{1}{2 (\ln 2)^2}$

9. Find $\sum_{n=0}^{\infty} \binom{2n}{n} \frac{1}{2^{2n} (2n+1)} =$ (a) π (b) $\frac{\pi}{2}$ (c) $\frac{1}{2}$ (d) $-\frac{1}{2}$

(背面仍有題目,請繼續作答)

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10. If $y > 0$, then $\int_0^{\infty} e^{-yx^2} dx =$ (a) $\frac{\pi}{y}$ (b) $\frac{\sqrt{\pi}}{2y}$ (c) $\frac{\sqrt{\pi}}{2\sqrt{y}}$ (d) $\frac{\pi}{2\sqrt{y}}$

二、非選擇題 50 分

1. (10%) Evaluate the following functions:

(5%) (a) $\frac{d}{dx} \int_x^{x^2} (y^2 x^4 + 6) dy =$

(5%) (b) $\lim_{x \rightarrow 0} \frac{2^x - 4^x}{x} =$

2. (10%) Show that

$$\int_0^{\infty} e^{-sx} x^n \cos ax dx = (-1)^n \frac{d^n}{ds^n} \frac{s}{s^2 + a^2} \quad a \neq 0 \quad \text{and } n = 0, 1, \dots$$

3. (10%) Evaluate

(5%) (a) $\int \frac{x^3 + 4x^2 - 4x - 1}{(x^2 + 1)^2} dx =$

(5%) (b) $\int_0^1 e^{-x} \cosh x dx =$

4. (10%) Evaluate

$$\int_S (x+y) d(x,y), \text{ where } S = \{(x,y) \mid -1 \leq x \leq 1, 0 \leq y \leq 1+|x|\}$$

5. (10%) Find the volume of the solid of revolution obtained by revolving the region

bounded by the curved $y = e^x$ and $y = x^2 + \frac{1}{2}$ from $x = 0$ to $x = 1$ about the x -axis.