

系所組別：企業管理學系丙組

考試科目：微積分

考試日期：0224，節次：3

※ 考生請注意：本試題不可使用計算機 請勿在本試題紙上作答，否則不予計分

Part A Multiple Choice Questions (40 points, 4 points each, Only one choice)

1. In the following equations, which one does **not** define y as a function of x ?
 - (A) $y = |2x + 3|$
 - (B) $5x^2 + y^2 = 12$
 - (C) $\frac{2}{3}x - 5y = 7$
 - (D) $3x^2 + 2y = 6$

2. Which of following statement is true?
 - (A) $\lim_{x \rightarrow 0} \sqrt{x} = 0$
 - (B) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 - (C) $\lim_{x \rightarrow 2} f(x) = 3, f(x) = \begin{cases} 3, & x \leq 2 \\ 0, & x > 2 \end{cases}$
 - (D) $\lim_{x \rightarrow 3} f(x) = 1, f(x) = \begin{cases} x - 2, & x \leq 3 \\ -x^2 + 8x - 14, & x > 3 \end{cases}$

3. The demand (D) and price (P) function of a meal-box store is $D = 32500 - 250P$ (monthly). Find the marginal revenue of per unit when $D = 15000$.
 - (A) -10
 - (B) 0
 - (C) 10
 - (D) 20

4. The slope of the tangent line to the ellipse given by $4x^2 + 9y^2 = 25$ at the point $(-2, 1)$ is
 - (A) $8/9$
 - (B) $-8/9$
 - (C) $9/8$
 - (D) $-9/8$

5. For the function $f(x) = (x^2 - 4)^{2/3}$, which of following description is correct?
 - (A) In the interval $(2 < x < \infty)$, the function is decreasing.
 - (B) In the interval $(0 < x < 2)$, the function is increasing.
 - (C) In the interval $(-2 < x < 0)$, the function is increasing.
 - (D) In the interval $(-\infty < x < -2)$, the function is increasing.

(背面仍有題目,請繼續作答)

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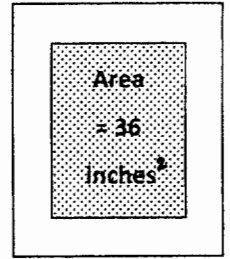
6. Which of following line is **not** the asymptote for the function $f(x) = \frac{x^2 - 1}{2x^2 - 8}$.
- (A) $x = 2$
(B) $x = -2$
(C) $y = 1/2$
(D) $y = -1/2$
7. Which of following derivative of the function is **incorrect**?
- (A) If $f(x) = e^{-1/x^2}$, then $f'(x) = \frac{2}{x^3} e^{-1/x^2}$.
(B) If $f(x) = (x^2 + 1)e^{4x}$, then $f'(x) = e^{4x}(x^2 + 2x + 4)$.
(C) If $f(x) = \frac{2}{(e^x + e^{-x})^3}$, then $f'(x) = \frac{-6(e^x - e^{-x})}{(e^x + e^{-x})^4}$.
(D) If $f(x) = xe^x - 4e^{-x}$, then $f'(x) = xe^x + e^x + 4e^{-x}$.
8. Which of following function has no inflection point?
- (A) $f(x) = 2x^4 - 8x^3 + 12x^2 + 12x$
(B) $f(x) = (x - 2)^3(x - 1)$
(C) $f(x) = x^3 - 9x^2 + 24x - 18$
(D) $f(x) = (x - 1)^3(x - 5)$
9. Which of following derivative of function is correct?
- (A) If $f(x) = \cos 3x + \sin^2 x$, then $f'(x) = -3 \sin x + 2 \sin x \cos x$.
(B) If $f(x) = \sec \pi x$, then $f'(x) = \tan \pi x \sec \pi x$.
(C) If $f(x) = 2 \tan^2 4x$, then $f'(x) = 16 \sec^2 4x \tan 4x$.
(D) If $f(x) = e^{2x} \sin 2x$, then $f'(x) = 2e^{2x}(\sin x + \cos x)$.
10. Apply the Ratio Test to find which of following series is divergent.
- (A) $\sum_{n=1}^{\infty} \frac{n}{4^n}$
(B) $\sum_{n=0}^{\infty} \frac{(-1)^n 2^n}{n!}$
(C) $\sum_{n=0}^{\infty} \frac{n 5^n}{n!}$
(D) $\sum_{n=0}^{\infty} \frac{4^n}{3^n + 1}$

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Part B Partial Credit Questions (60 points)

1. (a) [6 points] Find the points on the graph of $y=9-2x^2$ that are closet to $(0,1)$.
 (b) [6 points] A rectangular paper contains 36 square inches of print. The margins at the top and bottom of the paper are 2 inches wide. The margins on each side are 1.5 inches wide. Please find the minimum area of the paper used.
2. [8 points] Let V be the volume of a spherical ball and r be the radius. Gas is pumped into this spherical ball with rate of 6 cubic inches per minute ($\frac{dV}{dt} = 6$). Find the rate of change of the radius when $r=5$ inches. ($V = 4/3\pi r^3$)
3. [20 points, 5 points each] Find the indefinite integral of the following functions. (Let C represent the constant.)
 - (a) $\int (x-1)e^{x-2x} dx$
 - (b) $\int \frac{x^2}{x^3+1} dx$
 - (c) $\int (\tan^3 x)(\sec^2 x) dx$
 - (d) $\int e^{\sin x} \cos x dx$
4. [10 points] A company is selling two products, product A for x units and product B for y units. The range of x and y weekly are $200 \leq x \leq 300$ and $100 \leq y \leq 150$ respectively. The profit function is modeled as $profit = -(x-300)^2 - (y-150)^2 + 6000$
 Please find the average profit weekly for these two products.
5. [10 points] Find the expectation value and variance of the probability density function $f(x) = -3x^2 + 2, 0 \leq x \leq 1$.

<Hint> expectation = $\mu = E(x) = \int_a^b xf(x)dx$, and variance = $V(x) = \int_a^b (x-\mu)^2 f(x)dx$

[Reference]

Ron Larson & David C. Falvo, Calculus-An Applied Approach.