

系所組別：國際企業研究所乙組

考試科目：微積分

考試日期：0306，節次：3

※ 考生請注意：本試題 可 不可 使用計算機**I. True or False (30 points, 3 points each)**

- If $f(x)$ and $g(x)$ defined in R are uniformly continuous, then $f(x)+g(x)$ is also uniformly continuous.
- A sequence function of $f_n(x) = \frac{nx}{1+n^2x^2}$ on $[0,1]$ converges uniformly.
- The range of function $f(x) = e^{x^2}$ is the interval of $(1, \infty)$.
- For $x > 0$, a number A exists such that $\ln x \leq A$.
- All continuous functions have antiderivatives.
- Assuming f is any odd function and continuous on $[-c, c]$, where c is a constant.
Then $\int_{-c}^c f(x) dx = 0$.
- If $f(x) = 4$, then each Riemann sum of f in an interval $[0, 3]$ equals 12.
- y is a function of x if $x = |y|$ with $x \geq 0$.
- Let $f: [a, b] \rightarrow R$ be continuous and $g: [a, b] \rightarrow R$ defined by
 $g(x) = \max\{f(y) : a \leq y \leq x\}$. Then, g is continuous.
- The series $\sum_1^{\infty} a_n$, where $a_n = 0.2^n$, converges to zero.

II. Multiple Choice Questions (40 points, 4 points each, Only one choice)

- The limit of a Riemann sum at i^{th} right endpoint for
 $y = \sqrt[3]{x}$, $0 \leq x \leq 32$, can be written as which of followings?

$$(A) \lim_{n \rightarrow \infty} \sum_{i=1}^n \sqrt[3]{\frac{32i}{n}} \times \frac{32}{n}$$

$$(B) \lim_{n \rightarrow \infty} \sqrt[3]{\frac{32i}{n}} \times \frac{32}{n}$$

(C) no Riemann sum for y .

(背面仍有題目,請繼續作答)

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2. The profit function of a software company making a certain software product per month is given by $P(x) = -0.25x^2 + 150x - 4000$ dollars. Therefore, the marginal profit is positive per month when the number of copies sold per month is larger than?
- (A) 14 copies,
(B) 572 copies,
(C) 300 copies.
3. Based on question 2 above, what is the least number of copies sold per month to make the marginal profit positive if the fixed cost increases by NT\$2,000?
- (A) 279 copies,
(B) 301 copies,
(C) 22 copies.
4. The marginal profit per month of a certain product made by a company is $-x + 250$ where x is the number of units sold per month. If the fixed cost is NT\$5,000, then what is the profit function for the company?
- (A) $-0.5x^2 + 250x - 5000$,
(B) $-x - 4750$,
(C) $-0.2x^2 + 250x - 4750$.
5. If the number of units sold per month equals 300 units, what is the total profit per month?
- (A) a NT\$5,050 loss,
(B) a NT\$25,000 gain,
(C) a NT\$52,250 gain.
6. The unemployment rate at the end of December 2009 was 5.95% and fell at a rate of 0.05% per month. If the unemployment rate function is differentiable, then what is the unemployment rate function (count time in month and let $t=0$ be the end of December 2009)?
- (A) $-0.05 + 5.95t$
(B) $5.95t - 0.05t^2$
(C) $5.95 - 0.05t$

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7. What is the predicted unemployment rate at the end of March 2010?
(A) 17.4%
(B) 5.8%
(C) 17.8%
8. Peter has a loan at 2% annual interest rate to repay in 30 years from now. Additionally, he plans to make a payment of \$10,000 per year. Then, what is Peter's initial value problem regarding the amount, $L(t)$, he owes at any time t between 0 and 30 years?
(A) $\frac{dL(t)}{dt} = 0.02L(t) - 10,000, L(30) = 0,$
(B) $\frac{dL(t)}{dt} = 0.02L(t) + 10,000, L(30) = 0,$
(C) $\frac{dL(t)}{dt} = 0.02L(t), L(30) = 0.$
9. What are the critical points of $f(x) = x^2 e^{-x}$?
(A) $x = 0, \frac{1}{2},$
(B) $x = 0, 1,$
(C) $x = 0, 2.$
10. The natural domain or the vertical asymptotes of the function $f(x) = \frac{x-1}{x^3 - 10x^2 + 29x - 20}$ are
(A) natural domain is where $x \neq 0, 2, 5,$
(B) vertical asymptotes are at $x = 4, 5,$
(C) none of the above is correct.

(背面仍有題目,請繼續作答)

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III. Partial Credit Questions (30 points)

1. Under what theorem for continuous function to explain why the following equation has a root inside the interval (0, 1). (10 points)

$$f(x) = 5x^4 + 2x^2 - x - 5 = 0$$

2. A polynomial function is as follows:

$$f(x) = \frac{4}{3}x^3 - 8x^2 + 16x + 4$$

- (a) Find the interval where $f(x)$ is increasing. (5 points)
- (b) Find the interval where $f(x)$ is concave up. (5 points)
3. A pool initially holds 120 gallons of pure water. A solution containing 0.76mg ozone per gallon pours into the pool at a rate of 2 gallons per minute. Meanwhile, there is a drain at the bottom of the pool keeping the volume of solution in the pool remaining constant.
- (a) Write down the initial value problem including the initial condition for the amount, $y(t)$, of ozone (mg) at time t . (5 points)
- (b) When $t=2$, what is the amount of ozone (mg)? (5 points)