

科目：微積分

適用：經濟系(經濟分析組)

考生注意：

1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. (16%) Let f and g be functions whose first and second derivatives exist on an interval. Which of the following formulas is (are) true?

(a) $fg'' - f''g = (fg' - f'g)'$ (b) $(fg)'' - 2f'g' = fg'' + f''g$

2. (16%) The velocity of a particle moving in a straight line is given by

$v = t(t^2 + 5)^4 + 4t$. Given that the distance $s = 0$ at $t = 0$, find an expression for s in terms of t without any unknown constants.

3. (24%) Evaluate the following questions

(a) $\lim_{x \rightarrow 3} \frac{x^2 - x - 6}{\ln(3x - 6)}$

(b) $\int_1^2 2x^2 \sqrt{x^3 + 1} dx$

(c) $\int_1^{\infty} (1 - x)e^{-x} dx$

4. (16%) By cutting away identical squares from each corner of a rectangular piece of cardboard and folding up the resulting flaps, an open box may be made. If the cardboard is 8 in. long and 3 in. wide, find the dimensions of the box that will yield the maximum volume.

5. (16%) Find the relative extrema, if any, of the function $g(x) = \frac{x}{1+x^2}$. Use the second derivative test, if applicable.

6. (12%) Find the derivative of the following functions.

(a) $\frac{3x^3 + 5x^2 + 2x - 5}{x^2}$

(b) $x \left(1 - \frac{x-2}{x+1} \right)$