

科目：微積分 適用：經濟系二 資管系二

編號：222 231

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。

本試題

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1. Find the absolute and relative extrema of the following functions. (30%)

(a) $g(x) = -\frac{1}{8}(x+2)^2(x-4)^2, x \in [-4, 10],$

(b) $h(x, y) = 2x + y^2, \text{ subject to } x + 2y = 100, x \geq 0, y \geq 0.$

2. Is $f(x) = |x - 2|$ continuous or differentiable at $x = 2$? Explain your answer. (10%)

3. If $f(x)$ is concave and f has continuous second derivatives, show that its inverse function may not be convex. (10%)

4. True or False? Explain your answer. (30%)

(a) If $y = f(x)$ is a solution of a first-order differential equation, then $y = f(x) + C$ is also a solution.

(b) If f is continuous on $[0, \infty)$ and $\lim_{x \rightarrow \infty} f(x) = 0$, then $\int_0^{\infty} f(x) dx$ converges.

(c) $f(x, y) = x^2 + xy + 2$ is homogeneous.

5. Find the integral. (20%)

(a) $\int (x^3 e^x) dx$

(b) $\int x(\sqrt{4+x}) dx$

(c) $\int \frac{2x^3 - 5x^2 + 4x - 4}{x^2 - x} dx$

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