

科目：微積分

適用：經濟系二

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. (30%) Find the derivative of the following functions:

a. $y = (3 - e^{-4x})^3$

b. $f(x) = 5(x^4 - x)^7$

c. $g(x) = \ln \left| \frac{(5x+3)^6}{(4x+2)^9(8x+9)} \right|$

2. (20%) The total weekly revenue (in dollars) of the company realized in manufacturing and selling its rolltop desks is given by $R(x, y) = -0.2x^2 - 0.25y^2 - 0.2xy + 224x + 180y$ where x denotes the number of finished units and y denotes the number of unfinished units manufactured and sold each week. The total weekly cost attributable to the manufacture of these desks is given by $C(x, y) = 120x + 80y + 2000$ dollars. Determine how many finished units and how many unfinished units the company should manufacture each week in order to maximize its profit. What is the maximum profit (P) realizable?

3. (15%) The present value of a perpetual stream of income that flows continually at the rate of $p(t)$ dollars per year is given by the formula $PV = \int_0^{\infty} p(t)e^{-rt} dt$ where r is the interest rate compounded continuously. Using this formula, find the present value of a perpetual net income stream that is generated at the rate of $p(t) = 30000 + 2000t$ dollars per year.

4. (20%) Find the indefinite integral.

a. $\int xe^{8x} dx$

b. $\int x^8(2x^9 - 1)^6 dx$

5. (15%) Find the second-order partial derivatives of the function $f(x, y) = x^4y - xy^3$. Show that the mixed partial derivatives f_{xy} and f_{yx} are equal.