

科目：微積分

適用：經濟系二

編號：212

考生注意：

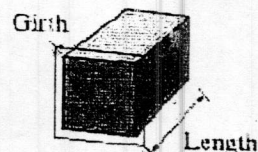
1. 依次序作答，只要標明題號，不必抄題。
2. 答案必須寫在答案卷上，否則不予計分。
3. 限用藍、黑色筆作答；試題須隨卷繳回。

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1. (20%) The US Postal Service (USPS) will accept only packages with length plus girth no more than 108 inches (See the figure). What are the dimensions of the largest volume package the USPS will accept?



2. (20%) Evaluate the following integrals

$$(a) \int \frac{e^{-0.025x}}{1 - e^{-0.025x}} dx$$

$$(b) \int_3^6 \frac{45x^2}{x^3 - 12} dx$$

3. (20%) I want to fence in a rectangular vegetable patch. The fencing for the east and west sides costs \$5 per foot, while the fencing for the north and south sides costs only \$3 per foot. I have a budget of \$150 for the project. What is the largest area I can enclose?

4. (20%) Find the derivative of the following functions:

$$(a) f(x) = (x^9 + 8) \ln x$$

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

5. (20%) Let function $H(x) = \begin{cases} 1 & \text{if } x \geq 0 \\ 0 & \text{if } x < 0 \end{cases}$ be the Heaviside function. We define

the Pulse function as $P_{a,b}(x) = H(x-a) - H(x-b)$, where $a < 0 < b$

- (a) (8%) Please sketch the graph of the pulse function.

- (b) (12%) Find the following limits:

$$(i) \lim_{x \rightarrow 0} P_{a,b}(x) \quad (ii) \lim_{x \rightarrow a^+} P_{a,b}(x) \quad (iii) \lim_{x \rightarrow a^-} P_{a,b}(x)$$

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