科目：微積分　適用：經濟系二 經濟系三

編號：222 722

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.試題隨卷繳回。

本試題
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第 1 頁

1. (16%) The demand and cost functions for a product are $p = 36 - 4x$ and $C = 2x^2 + 6$.
   (a) What level of production will produce a maximum profit?
   (b) What level of production will produce a minimum average cost per unit?

2. (20%) Find the derivative of the following functions:
   (a) $s(t) = \dfrac{1}{t^2 + 3t - 1}$ (b) $s(t) = t^2 e^t - 2t e^t + 2e^t$

3. (12%) A corporation manufactures a product at two locations. The cost functions for producing x_1 units at location 1 and x_2 units at location 2 are

   $C_1 = 0.05x_1^2 + 15x_1 + 5400$ and $C_2 = 0.03x_2^2 + 15x_2 + 6100$ respectively. The

   demand function for the product is $p = 225 - 0.4(x_1 + x_2)$. Find the production levels at the two locations that will maximize the profit.

4. (10%) A company produces a new product for which it estimates the annual sales to be 8000 units. Suppose that in any given year 10% of the units (regardless of age) will become inoperative. Find the market stabilization level of the product.

5. (30%) Evaluate the following definite integral.

   (a) $\displaystyle\int_0^2 \frac{x^2}{e^x}\,dx$. (b) $\displaystyle\int_0^4 \frac{x}{(x+4)^2}\,dx$ (c) $\displaystyle\int_1^3 \frac{x-1}{x^2(x+1)}\,dx$

6. (12%) You are in a pond 2 km from the nearest point on the coast. You are to go to point A, 3 km down the coast and 1 km inland (see figure). You can swim at a rate of 2 km per hour and you can walk at a rate of 4 km per hour. Toward which point on the coast should you swim in order to reach point A in the shortest time?