考試科目	微積分	所別	企管系 乙組	考試時間	2 月 23 日(星期六) 下午 13:20～15:00	第 3 節

1. The manager of a city bus line estimates the demand function to be $D(p)=150{,}000\sqrt{1.75-p}$, where p is the fare in dollars. The bus line currently charges a fare of \$1.25, and it plans to raise the fare to increase its revenues. Will this strategy succeed? (10%)
2. A company invests \$10 million in a new manufacturing plant that will generate a continuous stream of income of $2t$ million dollars per year, where t is the number of years that the company has been in operation. Find the net present value of this investment in the first 7 years at a continuous interest of 10%. (10%)
3. Universal Motors makes sedans and SUVs. The price function for sedans is $p=17-2x$ (for $0\le x\le 8$), and the price function of SUVs is $q=20-y$ (for $0\le y\le 20$), both in thousands of dollars, where x and y are, respectively, the numbers of sedans and SUVs produced per hour. If the company's cost function is $C(x,y)=15x+16y-2xy+5$ thousands dollars.
   a. Find the company's profit function? (5%)
   b. How many of each car should be produced and the prices that should be charges in order to maximize profit. Also find the maximum profit. (10%)
4. A clothing designer's sales S depend on x, the amount spent on television advertising, and y, the amount spent on print advertising (all in thousands of dollars), according the formula $S(x,y)=60x^2-6xy+90y^2+200$. If the company now spends 2 thousand dollars on television advertising and 3 thousand dollars on print advertising, use the total differential to estimate the change in sales if television advertising is increased by \$500 and print advertising is decreased by \$500. (20%)
5. As the pace of change in modern society quickens, popular fashion may fluctuate increasingly rapidly. Suppose that sales for a fashion item are $\cos t^2$ in year t.
   a. Find the formula of the extra sales during the first x years. (5%)
   b. Find the Taylor series at 0 for $\cos t^2$. (10%)
   c. Estimate the sales in part (a) by using the first three terms of the series found in part (b) evaluated at $x=1$. (10%)
6. You deposit \$8000 into a bank account paying 5% interest compounded continuously, and you withdraw fund continuously at the rate of \$1000 per year.
   a. Let $y(t)$ is the amount in the account after t years. Write a differential equation and initial condition to describe the amount $y(t)$. (5%)
   b. Solve this differential equation and initial value. (15%)

本考試：□ 不需使用計算機，☑ 使用計算機

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