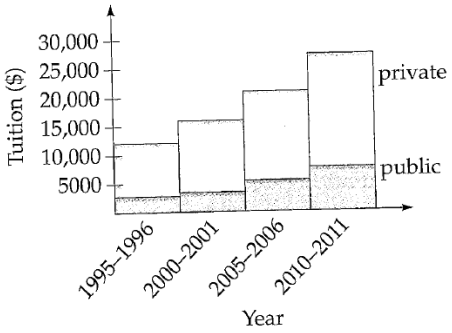
東吳大學 106 學年度碩士班研究生招生考試試題

系級	企業管理學系碩士班 C 組	考試時間	100 分鐘
科目	微積分	本科總分	100 分

1. The tuition for a private college is approximated by the function $f(x) = 650x^2 + 3{,}000x + 12{,}000$, where x is the number of five-year intervals since the academic year 1995-96(so the years in the graph are numbered x=0 through x=3) （15分）



a. Use this function to predict tuition in the academic year 2020-21.

b. Find the derivative of this function for the x-value that you used in part (a) and interpret it as a rate of change in the proper units.

c. From your answer to part (b), estimate how rapidly tuition will be increasing per year in 2020-21.

2. Suppose that after x months, monthly sales of a compact disc are predicted to be $s(x) = x^2(8 \quad x^3)$ thousand (for$0 \le x \le 2$). Find the rate of change of the sales after 1 month and interpret your answer. （10 分）

3. A politician estimates that by campaigning in a country for x days, she will gain 2x (thousand) votes, but her campaign expenses will be $5x^2 + 500$ dollars. She wants to campaign for the number of days that maximizes the number of votes per dollar, $f(x) = \dfrac{2x}{5x^2 + 500}$. For how many days should she campaign? （10 分）

4. Based on a recent study, the “happiness” of people who live in a country whose average temperature is t degrees Fahrenheit is given by $h(t) = 8.2 - (0.01t - 2.8)^2$, for $35 \le t \le 72$ (“Happiness” was rated from 1=“not at all happy” to 4 “very happy”.) Find $h(40)$ and $h'(40)$. Interpret your answer. （10 分）

5. In 2013, annual revenue at 3D Systems were 474 million dollars and growing at the rate of 28.4x+120 million dollars per year, where x stands for the number of years since 2013. Find a formula for 3D Systems’ revenues at any time x and use your formula to predict their revenues in 2020. （10 分）

6. World consumption of tin is running of at the rate of $342e^{0.02t}$ thousand metric tons per year, where t is measured in years and t=0 corresponds to 2014. （13 分）

(a) Find a formula for the total amount of tin that will be consumed within t years of 2014.

(b) When will the known world resources of 4900 thousand metric tons of tin be exhausted?

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7. An electronics company generates a continuous stream of income of $4t$ million dollars per year, whether t is the number of years that the company has been in operation. Find the present value of this stream of income over the first 10 years at a continuous interest rate of 10%. （10 分）

8. A study found that a businessperson with a master's degree in business administration (MBA) earned an average salary of $S(x, y) = 48340 + 4930x + 3840y$ dollars in 2005, where x is the number of years of work experience before the MBA, and y is the number of years of work experience after the MBA.

Find and interpret the marginals S_x and S_y.（12 分）

9. Suppose that you have saved $5000, and that you expect to save an additional $3000 during each year. If you deposit these savings in a bank account paying 5% interest compounded continuously, find a formula for your bank balance after *t* years. （10 分）