考試科目	微積分	系所別	企業管理研究所乙組	考試時間	2 月 3 日(五) 第 四 節

※Show all calculations and display answers clearly. No credit will be given for unjustified answers.

1. (10 points) Evaluate the limit: $\lim_{x\to 0+}[\cos(3x)]^{\frac{1}{x^2}}$

2. (10 points) Evaluate: $\frac{d}{dx}\left[(2-3x^4)^2\ln(x^2+1)\right]$

3. Evaluate the integrals:

   (a) (10 points) $\int \frac{2x-3}{x^3+x}dx$

   (b) (10 points) $\int x^3\sqrt{x^2-5}dx$

   (c) (10 points) $\int \tan^{-1}(\frac{1}{x})dx$

4. For each of the following series, determine whether it is absolutely convergent, conditionally convergent, or divergent; state which test you are using to determine convergence/divergence, and show all work.

   (a) (10 points) $\sum_{k=0}^{\infty}\frac{3^{k+1}}{(k+1)^2}e^k$

   (b) (10 points) $\sum_{k=0}^{\infty}\frac{\sin(k)}{(k+1)^2}$

5. (10 points) A company sells shoes to dealers at \$20 per pair if fewer than 50 pairs are ordered. If 50 or more pairs are ordered (up to 600), the price per pair is reduced 2 cents times the number ordered. What size order produces maximum revenue for the company?

6. (10 points) For a certain product, the demand function is $D(x) = 1000 - 25x$ and the supply function is $S(x) = 100 + x^2$, where x is the quantity of the products. Find the market equilibrium price and compute the consumer surplus.

7. (10 points) Ian has \$20 to spend on beer (x) and pizza slices (y). A beer costs \$2 while a pizza slice costs \$1. His utility is $U(x,y) = x^{\frac{1}{2}}y^{\frac{1}{2}}$. How many pizza slices and beers should Ian choose to maximize his utility? What is the change in the value of his optimized utility if he spends \$21 on buying beers and pizza slices?

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。