考試科目	微積分	系所別	企業管理學研究所(MBA 學位學程)乙組	考試時間	2 月 6 日(五) 第 四 節

Show all your work to earn the credits.

1. Evaluate each of the following limits:

   (a) (10 points) $\lim_{x\to-\infty} \dfrac{\sqrt{9x^2+3}}{4x-1}$

   (b) (10 points) $\lim_{x\to 0}\left(\dfrac{1}{2x^2}+\dfrac{1}{x^3}+\dfrac{1}{x^4}-\dfrac{e^{\sin x}}{x^4}\right)$

2. Find each of the following derivatives:

   (a) (10 points) Find $f'(x)$ for $f(x)=\ln(x^3(4x+1)^5)$.

   (b) (10 points) Find $g^{(83)}(0)$, the 83th-order derivative of $g(x)=x^2\arctan(x)$.

3. Evaluate each of the following integrals:

   (a) (10 points) $\int\left(\dfrac{2}{\cos^2 x}\sqrt{6+\dfrac{\sin x}{\cos x}}+x\right)dx$

   (b) (10 points) $\int_0^2\int_{y/2}^1 e^{3x^2+2}dxdy$

   (c) (10 points) $\int\dfrac{4}{\sin^3 x}dx$

4. Let $F(x)=\int_0^x \sqrt{t}\sin t dt$.

   (a) (3 points) Find all the critical point(s), if any, for the function $F(x)$.

   (b) (3 points) Decide whether $F(x)$ has a local maximum or a local minimum at $x=\pi$. Provide a justification for your answer.

   (c) (4 points) Let $G(x)=\int_0^x t^2\sin(t^2)dt$. Find the constants a, b, c and d such that $G(x)=aF(bx^2+cx+d)$.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

考試科目	微積分	系所別	企業管理學研究所(MBA 學位學程)乙組	考試時間	2 月 6 日(五) 第 四 節

5. (10 points) Let the demand and supply curves be

$$D(q) = \frac{250}{q+20} \quad \text{and} \quad S(q) = q + 5,$$

respectively. Find the equilibrium point, consumer's surplus and producer's surplus.

6. (10 points) A company manufactures two products, A and B. Let x be the number of units of product A produced and y be the number of units of product B produced. Because of limited materials and capital, the quantities produced must satisfy the equation $4x + 2y = 80$. Let the company's profit function is $P(x, y) = x^3 + 2y^2$. Find the production levels of products A and B that maximize the company's profit.

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。