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

計算題 100 分，請提供詳細計算過程

1. (5 分) Given that $\lim_{x \to 1} f(x) = 5$ and $\lim_{x \to 1} g(x) = -2$, find the limit $\lim_{x \to 1} \dfrac{4f(x)}{g(x)}$

2. (5 分) Evaluate the limit $\lim_{x \to 2} \left(5x^2 - 4x + 3 \right)$

3. (5 分) Evaluate the limit $\lim_{x \to 0} \dfrac{(3+x)^2 - 9}{x}$, if it exists

4. (5 分) Evaluate the limit $\lim_{x \to \infty} \dfrac{x!}{x^x}$

5. (5 分) Evaluate the limit $\lim_{x \to \infty} \dfrac{3x}{e^x}$

6. (5 分) Find f given that $f'(x) = 4x - 2\sin x$ and $f(0) = 1$

7. (10 分) Find $F'(10)$ given that $F(x) = f(g(x))$ and $g(10) = 2, g'(10) = 5, f'(2) = 4,$ and $f'(5) = 6$

8. (10 分) Find the minimum points of the function $f(x) = (2 - x^2)^2 + 4x^2$.

9. (10 分) Find the function $f(x)$ whose tangent has slope $6x^2 - 4x + 3$ for each value of x and whose graph passes through the point (2, 10).

10. (10 分) Evaluate the definite integral $\int_0^1 \left(e^{-x} + \dfrac{3\sqrt{x}}{2} \right) dx$

11. (10 分) Find the area of the region bounded by the curves $y = x^2$, $y = -x^2$, and $0 \le x \le 3$

12. (10 分) Evaluate $\sum_{k=1}^{\infty} \left(\dfrac{2}{3^k} + \dfrac{1}{2^k} \right)$

13. (10 分) Evaluate $\int_0^1 \int_0^z \int_0^y z e^{-y^2} \, dx \, dy \, dz$