

系級	經濟學系二年級	考試時間	100 分鐘
科目	微積分	本科總分	100分

**Show all your work! No point is given without showing work!**

1. (20pts) A manufacturer of pocket cameras finds that the total cost of producing and marketing  $x$  cameras per month is  $C(x) = 200 + 5x + \frac{1}{2}x^2$  dollars. The manufacturer can sell cameras produced for \$25 each.

- (a) Find the revenue function. (5 pts)  
 (b) Find the marginal revenue function. (5 pts)  
 (c) Find the monthly profit function. (5 pts)  
 (d) Find the monthly marginal profit function. (5 pts)

2. (10pts) Find  $\frac{d}{dx} f(x)$  for the following function.

- (a)  $f(x) = \left(\frac{1+x}{1-x}\right)^6$  (5 pts)      (b)  $f(x) = (3-2x-x^4)^{\frac{1}{4}}$  (5 pts)

3. (20 pts) Find the  $n$ th-degree Taylor polynomial.

- (a)  $f(x) = \ln(1+x)$ ,  $n=5$  (10 pts)  
 (b)  $f(x) = e^{x^2}$ ,  $n=2$  (10 pts)

4. (20 pts) Evaluate  $\iint_R f(x, y) dA$

- (a)  $\iint_R \frac{1}{1+y} dA$ ,  $R = \{(x, y) | 0 \leq x \leq 1, 0 \leq y \leq e^x - 1\}$  (10pts)  
 (b)  $\iint_R 2x dA$ ,  $R = \{(x, y) | 0 \leq x \leq \sqrt{1-y^2}, 0 \leq y \leq 1\}$  (10pts)

5. (20 pts) Find the minimum and maximum values of the function subject to the given function to the given constraint by using *Lagrange multiplier*.

- (a)  $f(x, y, z) = x^2 + y^2 + z^2$  subject to  $x - y + z = 1$  (10 pts)  
 (b)  $f(x, y, z) = x + 2y + z$  subject to  $x^2 + y^2 + z^2 = 4$  (10pts)

6. (10 pts) Find the limit (if it exists)

- (a)  $\lim_{x \rightarrow 2} \frac{x-2}{\ln(3x-5)}$  (5 pts)      (b)  $\lim_{x \rightarrow \infty} x^4 e^{-x}$  (5 pts)