淡江大學 101 學年度轉學生招生考試試題

系別：產業經濟學系三年級　　科目：微　積　分

考試日期：7 月 17 日(星期二) 第 4 節　　本試題共 5 大題，1 頁

1. (25%) Use differentiation rules to find $f'(x)$ for the following given function.

(a) $f(x)=\sqrt{x}\left(x^3-3x^2+2x-1\right)$; **(b)** $f(x)=\left(x^2+1+\dfrac{1}{\sqrt{x}}\right)^{100}$; **(c)** $f(x)=\left(\dfrac{x-1}{2x+1}\right)^{10}$;

(d) $f(x)=(x^2-x+1)(x^3+2x^2+x-5)$; **(e)** $f(x)=\sqrt[3]{x^3-x+\sqrt{x}}$.

2. (20%) Find an equation of the tangent to the curve at the indicated point.

(a) $y=\dfrac{\ln x}{x}$ **at the point** $P(e\ ,\ e^{-1})$ **(b)** $f(x)=\log_5(x^2+x+3)$ **at the point** $P(1\ ,\ 1)$.

3. (25%) Evaluate the following integrals:

(a) $\int \dfrac{(x^2+1)^2}{x^3}\,dx$; **(b)** $\int \dfrac{2x+5}{x^2+4x+5}\,dx$; **(c)** $\int e^x \sin x\,dx$; **(d)** $\int_0^1 \dfrac{x^2}{1+x}\,dx$;

(e) $\int_{-1}^{3} |x-2|\,dx$.

4. (20%) Compute the following improper integrals:

(a) $\int_2^\infty x\,e^{-x}dx$; **(b)** $\int_0^1 \dfrac{1}{\sqrt{x}}\,dx$; **(c)** $\int_{-1}^1 \dfrac{1}{x}\,dx$; **(d)** $\int_1^\infty \dfrac{e^{-\sqrt{x}}}{\sqrt{x}}\,dx$; **(e)** $\int_1^\infty \dfrac{\ln x}{x}\,dx$

5. (10%) Use Lagrange multipliers to find the indicated extremum.

(a) max $f(x,y)=x^2+2y^2-xy$ **subject to** $2x+y=22$

(b) max $f(x,y)=e^{xy}$ **subject to** $x^2+y^2=4$