國立中山大學104學年度碩士暨碩士專班招生考試試題

科目名稱：微積分【海工系碩士班丙組選考】　　題號：459007

※本科目依簡章規定「可以」使用計算機（廠牌、功能不拘）（問答申論題）　　

1. (20%)【Limits】

(a) (5%) $\lim_{x\to 0}\frac{|x|}{x}$;　　(b) (5%) $\lim_{x\to 1}\frac{1-\sqrt{x}}{1-x}$

(c) (5%) $\lim_{x\to 8}\frac{x-8}{\sqrt[3]{x}-2}$;　　(d) (5%) $\lim_{x\to 0}\sin\left(\frac{1}{x}\right)$, $x>0$

2. (30%)【Differentiation】

(a) (10%) Given $2x^3-2y^2=5$, find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$.

(b) (10%) Given $y=3u+1$, $u=x^{-2}$, $x=1-s$, find $\frac{dy}{ds}$.

(c) (10%) Find the slope of the curve $x^3-3xy^2+y^3=1$ at (2, -1).

3. (30%)【Integration】

(a) (10%) $\int x^2e^{3x}dx$;　　(b) (10%) $\int x\cos x^2dx$

(c) (10%) $\int_0^1\frac{x^2-4x+3}{(x-2)^2}dx$

4. (10%)【Application】

Find the arc length (弧長) of the curve $y=\frac{x^3}{6}+\frac{1}{2x}$ from $x=1$ to $x=2$.

5. (10%)【Application】

Find the area bounded by the graphs of $x^2+y^2=4$ and $r=4\cos\theta$.