

九十一學年度 生命科學院四所 碩士班研究生招生考試

科目 微積分 科號 1001 共 1 頁第 1 頁 *請在試卷【答案卷】內作答

1. Find the limits for the following:(20%)

$$\lim_{x \rightarrow 0} \frac{\sin x - x}{\sinh x}$$

$$\lim_{x \rightarrow \infty} \frac{\ln x}{x^\alpha}, \alpha > 0$$

$$\lim_{x \rightarrow 0} \frac{\tan ax - a \sin x}{x(1 - \cos ax)}$$

$$\lim_{x \rightarrow 0} \frac{\pi/x}{\cot(\pi x/2)}$$

$$\lim_{x \rightarrow \infty} \left[x - x^2 \ln \left(1 + \frac{1}{x} \right) \right]$$

2. Differentiate the following:(20%)

$$\sqrt{\frac{(x-1)(x+3)}{(x+1)^3}}$$

$$\frac{x}{2} - \frac{\sin 2x}{4}$$

$$\frac{x e^x - x^2}{x + e^x}$$

$$\arctan x^3$$

$$\sqrt{\arctan \left(\sinh \frac{x}{3} \right)}$$

3. Find the following integrals:(40%)

$$\int \frac{x+1}{9x^2+1} dx$$

$$\int \frac{x dx}{\sqrt{a^2 - x^4}}$$

$$\int \frac{dx}{1 + \sin x}$$

$$\int \frac{\cos(\ln x)}{x} dx$$

$$\int \frac{x+1}{x\sqrt{x-2}} dx$$

$$\int \frac{\ln \tan x}{\sin x \cos x} dx$$

$$\int \sqrt{e^x - 1} dx$$

$$\int x \cosh x dx$$

$$\int \frac{dx}{\sin^4 x}$$

$$\int \frac{x dx}{\sqrt{4x+2-x^2}}$$

4. Find the following integrals:(20%)

$$\int_0^1 \frac{dx}{(x^2+1)\sqrt{1-x^2}}$$

$$\int_1^{\infty} \frac{1 - \ln x}{x^2} dx$$

$$\int_0^{e-1} \ln(x+1) dx$$

$$\int_0^{\infty} \frac{\arctan(x-1) dx}{\sqrt[3]{(x-1)^4}}$$

$$\int_{\pi/2}^0 e^{2x} \cos 3x dx$$