考試科目	微積分	系所別	風險管理與保險學系	考試時間	2月12日(三)第2節

Problem 1 (20 points) (10% each)

Evaluate the integrals.

(a)

$$\int_0^3 \frac{x^2}{\sqrt{x+1}}dx.$$

(b)

$$\int \frac{3x^3-2x-2}{x^2(x^2+1)}dx.$$

Problem 2 (20 points) (10% each)

Find the following limits if they exist.

(a)

$$\lim_{x\to 0^+}(1-cosx)^{\frac{1}{lnx}}.$$

(b)

$$\lim_{x\to 1}(\frac{1}{lnx}-\frac{1}{x-1}).$$

Problem 3 (15 points)(15%)

Let

$$F(x)=\int_0^{x^2} cos(t^2+t)dt.$$

(a) (6%) Find $F'(x)$.

(b) (9%) Find

$$\lim_{x\to 0}\frac{F(x)}{x^2}.$$

備註	一、作答於試題上者，不予計分。 二、試題請隨卷繳交。

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Problem 4 (15 points)(5% each)

(a) Derive the MacLaurin series of

$$tan^{-1}x.$$

(b) Find the value of $a \in R$ such that the limit

$$\lim_{x\to 0} \frac{sin(ax) - sinx - tan^{-1}x}{x^3}$$

is finite.

(c) Evaluate the above limit.

Problem 5 (15 points)(15%)

Find the maximum and the minimum of the function

$$f(x,y) = 3x^2 - 2y^2$$

on the curve

$$2x^2 - 2xy + y^2 = 1.$$

Problem 6 (15 points) (5% each)

Let $f(x) = xe^x$.

(a) Find the Taylor series for $f(x)$ at $x = 0$.

(b) Calculate

$$\int_0^x te^t dt$$

and find its Taylor series at $x = 0$.

(c) Find the sum

$$\sum_{n=0}^{\infty} \frac{1}{n!(n+2)}.$$

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