考生作答須知：

一、　本試卷共有兩部分，各佔50分。每題配分標示於題後，總分100分。

二、　答案請於答案卷上依題號次序作答，題號務必標示清楚，並寫出計算過程，否則不予計分。

第一部分：微分 (50%)

1. $\lim_{x\to 1}\dfrac{\ln\left(\cos\left(x-1\right)\right)}{1-\sin\left(\frac{\pi}{2}x\right)}$ (5%)

2. $\lim_{x\to 0}\dfrac{\sqrt{1+\tan x}-\sqrt{1+\sin x}}{x^3}$ (5%)

3. $y=\dfrac{1+\sin x}{\sqrt{x}}$ ， $x^2y''+xy'+\left(x^2-\frac{1}{4}\right)y=?$ (5%)

4. $f(x)=\left(\sqrt{x+2}\right)^{\sqrt{4x}}$ ， $f'(4)=?$ (5%)

5. $f(x)=\dfrac{x-5}{x^2-x-2}$ ， $\dfrac{f^{(100)}(0)}{100!}=?$ (10%)

6. 利用一階導數極值判斷法，證明 $\pi^e < e^\pi$ 。 (10%)

7. $f(x)=x^5-5x^3+10x-3$ ，求相對極大值及相對極小值 (10%)

第二部分：積分 (50%)

8. A manufacturer of CCU-Pads, tablet PC, finds that its total cost in producing 100 CCU-Pads per week is $C(100)$=\$2150 and that its marginal cost is $MC(x)=10+0.2x$ dollars per CCU-Pad at production level x CCU-Pads per week.
   (1) Find the amount by which total cost will increase if production is increased from a=100 to b=120 CCU-Pads per week. (5%)
   (2) Find the total cost in producing 120 CCU-Pads per week. (5%)

9. Find
   (1) $\int_1^e \sqrt{x}\ln x\,dx$ (5%)
   (2) $\int e^x\cos x\,dx$ (5%)

10.Evaluate $\int \sec 2x dx$ and $\int \sec^2 2x dx$ (10%)

11.Prove $\int_1^2 dx \int_0^2 (x^2 + xy + y^2) dy = \int_0^2 dy \int_1^2 (x^2 + xy + y^2) dx$ (10%)

12.Evaluate the iterated integral $\int_0^4 \left\{ \int_1^{\sqrt{y}} (x + y) dx \right\} dy$ (10%)