答案請寫於答案卷上

須列計算過程，否則不予計分

總計十題，每題十分

1. $f(x)=\begin{cases}x^2-a & x\ge 2\\ mx+6 & x<2\end{cases}$. Find the value of m and a to make f differentiable everywhere.

2. Which of the following one(s) is(are) convergent?

   (1). $\int_0^\infty \frac{dx}{x^3+1}$

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

   (3). $\int_{-\infty}^{\infty} \sin x\,dx$

   (4). $\int_2^\infty \frac{dx}{x(\ln x)^p}$, $p>1$

3. Find $\left(f^{-1}\right)'(2)$, if $x^2-\left(f(x)\right)^3=xf(x)$, $x\ge 0$.

4. Evaluate (1) $\lim_{n\to\infty}\sum_{i=1}^{n}\frac{1}{n}\tan\left(\frac{i}{n}\right)$ (5 points)

   (2) $\lim_{n\to\infty}\left(\frac{1}{\sqrt{2n^2+n}}+\frac{1}{\sqrt{2n^2+2n}}+\frac{1}{\sqrt{2n^2+3n}}+\cdots+\frac{1}{\sqrt{3n^2}}\right)$ (5 points)

5. Let Ω be the solid enclosed by two solids of revolution (rotating about x-axis), one is $y=\sqrt{x}$, the other is $y=\sqrt{2-x}$. Find its surface area.

6. Find $\int_2^3 (2x+3)(x^2+3x-2)^{\frac{3}{2}}dx$.

7. Find $\frac{dy}{dx}$, given (1) $y=\frac{(x^2-3x-2)^2(2x^2+x-1)^3}{(x^4-x^2+1)^4(2x+1)^6}$; (2) $y=\left[\cos\left(\sqrt{x}-x\right)\right]^3$.
   (5 points each)

8. A certain region R on xy plan is bounded by three curves: $y=x^2$, $y=x^2/8$, and $y=1/x$. Find the area of R.

9. Find the extreme value(s) of $f(x,y)=x^2+2xy+y^2$, given $x^2+y^2\le 4$, with Lagrange multiplier.

10. Let $u=f(x,y,z)=e^{x+y-z}\sin(x^2y+yz^2)$, $x=r\cos\theta$, $y=r\sin\theta$, $z=\theta^2$. Find $\frac{\partial u}{\partial r}$.

試題隨卷繳回