一、選擇題（一題5分，共計50分）

1. If $f(x)=\begin{cases} c & \text{if } x=-3 \\ \dfrac{9-x^2}{4-(x^2+7)^{1/2}} & \text{if } |x|<3 \\ d & \text{if } x=3 \end{cases}$, then f is continuous on $[-3,3]$ provided

a) $c=8$ and $d=-8$ b) $c=d=8$ c) $c=-8$, $d=8$ d) $c=d=6$ e) $c\neq d$

2. If $f(x)=\begin{cases} |x| & \text{if } |x|\le 1 \\ 2-|x| & \text{if } x>1 \end{cases}$, then which of the following is true?

a) f is not continuous at $x=1$ but it is differentiable at $x=1$

b) f is differentiable at all x

c) f is continuous but not differentiable at $x=0$

d) f is continuous and differentiable at $x=1$

e) none of these

3. A rectangle has its vertices on the x-axis, the y-axis, the origin, and the graph of $y=4-x^2$. Find the maximum possible area for such a rectangle.

a) $\dfrac{8\sqrt{3}}{9}$ b) $\dfrac{16\sqrt{3}}{9}$ c) $\dfrac{32\sqrt{3}}{9}$ d) $2\sqrt{3}$ e) none of these

4. $\int_0^{\frac{\pi}{2}} \sin x(1+\sqrt{\cos x})^2 dx$ equals

a) $\dfrac{17}{6}$ b) 3 c) $\dfrac{19}{6}$ d) $-\dfrac{19}{6}$ e) none of these

5. The area bounded by the curves $y+x^3=0$, $y=\sqrt{x}$, and $3y+7x=10$ equals

a) $\dfrac{53}{3}$ b) $\dfrac{53}{4}$ c) $\dfrac{53}{6}$ d) $\dfrac{51}{5}$ e) none of these

6. The volume of the solid generated by revolving the region bounded by the curve $y=x^3$, $x=-2$, and $y=0$ about the x-axis equals

a) $\dfrac{128\pi}{5}$ b) 18π c) $\dfrac{120\pi}{2}$ d) $\dfrac{128\pi}{7}$ e) none of these

7. The series $\sum_{n=1}^{\infty}\dfrac{1}{\ln(n)}$

a) converges by comparison to $a_n=\dfrac{1}{n}$ b) diverges by comparison to $a_n=\dfrac{1}{n}$

c) converges by the integral test d) converges by comparison to $a_n=\dfrac{1}{n^2}$

e) none of these

(背面仍有題目,請繼續作答)

8. The interval of convergence of $s=\frac{x}{2^2\cdot 3}+\frac{x^2}{3^2\cdot 3^2}+\frac{x^3}{4^2\cdot 3^3}+\cdots$ is

a) $(-3,3)$ b) $[-3,3)$ c) $(-3,3]$ d) $[-3,3]$ e) none of these

9. What dose $\iint_R (x^3-y^3)dA$ equal where R is bounded by $y=x^3, x=0$ and $y=0$?

a) $-\frac{45}{364}$ b) $\frac{45}{364}$ c) $\frac{9}{46}$ d) $\frac{1}{5}$ e) none of these

10. The volume of the solid in the first octant bounded by $x+y=4$ and $z=xy$ is

a) $\frac{44}{3}$ b)15 c) $\frac{42}{3}$ d) $\frac{43}{3}$ e) none of these

二、計算或證明題（一題 10 分，共計 50 分），需寫出詳細計算或證明過程，否則扣分或不計分。

1. Using the Definition of a Limit, Show that $\lim_{x\to c}\frac{1}{x}=\frac{1}{c}, c\neq 0$.

2. Show that $f(x)=\sqrt{2x+1}+2x$ is continuous at 3.

3. Show that f satisfies the hypotheses of Rolle's theorem on the interval $[2,6]$, and find all numbers c in (2, 6) that satisfy the conclusion of Rolle's theorem for $f(x)=2x^2-16x+11$.

4. A solid has as its base the region in the xy-plane bounded by the graphs of $y^2=4x$ and $x=4$. If every cross section by a plane perpendicular to the y-axis is a semicircle, find the volume of the solid.

5. Express $\iint_R (3x+2y)dA$ over the triangular region with vertices (-2, -2), (-1, -2), (-1, -1) as an iterated integral and find its value.