

1. Find dy/dx and d^2y/dx^2 at the given point $(1/2, \pi/4)$ for the equation $x = \sin^2 y$. (10%)
2. Find the critical numbers, points of inflection, and vertical and horizontal asymptotes of $f(x) = \frac{x^{1/3}}{x^{2/3} - 4}$ (if any), describe the concavity of f , and sketch the graph of f . (20%)
3. Sketch the polar curves $r = 2\sin \theta$ and $r = \frac{3}{2} - \sin \theta$, and calculate the area enclosed by them. (10%)
4. Calculate $\int \frac{x^3 + 4x^2 - 4x - 1}{(x^2 + 1)^2} dx$. (10%)
5. Determine whether the following series converges or diverges: (a) $\sum \ln\left(\frac{k+1}{k}\right)$ (b) $\sum (\sqrt{k} - \sqrt{k-1})^k$ (10%)
6. Expand $\sin(x)$ in power of $x - \pi$ and specify the values of x for which the expansion is valid. (10%)
7. Find the length of the given curve, $\vec{r}(t) = (\ln t)\vec{i} + 2t\vec{j} + t^2\vec{k}$ from $t = 1$ to $t = e$. (10%)
8. Find the area of the surface $z^2 = x^2 + y^2$ from $z=0$ to $z=1$. (10%)
9. Let T be the solid ellipsoid $\left(\frac{x}{a}\right)^2 + \left(\frac{y}{b}\right)^2 + \left(\frac{z}{c}\right)^2 \leq 1$.
Calculate the volume of T and $\iiint_T \left[\left(\frac{x}{a}\right)^2 + \left(\frac{y}{b}\right)^2 + \left(\frac{z}{c}\right)^2\right] dx dy dz$. (10%)

試題隨卷繳回