



1. Determine the value of x in the domain of definition makes the following function continuous. $f(x) = x \csc x, f(0) = 1$. (5 分)
2. Write the first four terms of the following sequence. $\left\{ \frac{(-1)^n x^{2n-1}}{1.3.5.,.,.(2n-1)} \right\}$ (5 分)
3. Find a possible n th term for the sequence whose first 5 terms are indicated as follows. $\frac{-1}{5}, \frac{3}{8}, \frac{-5}{11}, \frac{7}{14}, \frac{-9}{17}, \dots$ (5 分)
4. If $xy - \ln y = 1$, calculate (a) $\frac{dy}{dx}$, (b) $\frac{d^2y}{dx^2}$. (10 分)
5. Evaluate $\int_0^{\infty} \frac{dx}{1+x^2}$. (5 分)
6. Evaluate $\lim_{M \rightarrow \infty} \int_0^M \frac{dx}{x^4 + 4}$. (10 分)
7. Let $f(x) = \sum_1^{\infty} \frac{\sin nx}{n^3}$, evaluate $\int_0^{\pi} f(x) dx$. (10 分)
8. Find the second derivative of the function $f(x) = x \ln x + 2x^2$ at $x = 1$. (10 分)
9. Evaluate $\int_0^2 \frac{x^2 - 1}{\sqrt{x^3 - 3x + 4}} dx$. (10 分)
10. Let α be the positive root of the equation $x^2 + x - 1 = 0$. What is the value of the series $\sum_{n=0}^{\infty} \alpha^n$? (10 分)
11. Evaluate $\int_0^{\ln 2} x e^x dx$. (10 分)
12. A company sells one product whose demand functions is given by $q = 100 e^{-0.05p}$ where q represents the units of the product and p is the price of a product. Suppose that the revenue $R = pq$. Find the price of the product as the company has the maximal revenue. (10 分)