

國立嘉義大學 114 學年度
應用數學系碩士班(甲組)招生考試試題

科目：微積分（每題 10 分，共 100 分）

1. Determine the vertical and slant (oblique) asymptote of $f(x) = \frac{x^2 - 2x + 4}{x - 2}$.
2. Differentiate both forms of $y = \frac{1 - \cos x}{\sin x} = \csc x - \cot x$.
3. Find the derivative of $y = \left(\frac{3x-1}{x^2+3}\right)^2$.
4. Given $x^2 + y^2 = 25$, find $\frac{d^2y}{dx^2}$.
5. Find the derivative of $F(x) = \int_{\pi/2}^{x^2} \cos t \, dt$.
6. Find the indefinite integral $\int \frac{1}{x\sqrt{4 - (\ln(x))^2}} dx$.
7. Find the indefinite integral $\int \frac{1}{x^2(1+x)} dx$.
8. Find the improper integral $\int_0^1 x^3 (\ln(x))^2 dx$.
9. Find the sum of the series $\sum_{n=1}^{\infty} \frac{1}{(3n-2)(3n+1)}$.
10. Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{(-1)^n}{\ln(n+1)}$.