填空題：請按題號順序只將答案寫在答案卷第一頁，每題十分，計算過程不計分

1. $\dfrac{d}{dx}\sin^2(\ln(x)) =$

2. $\tan(\arcsin(a)) =$

3. $\dfrac{d}{dx}(x^{\ln x}) =$

4. Please write the domain and range of $\arcsin(x)$

5. Please write the first two nonzero terms of the Taylor series of $\tan(x)$

6. Let the power series solution of the differential equation $\dfrac{d^2 y}{dx^2} + x^2 y = x$ be

   represented in the form $y = a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \Lambda\,\Lambda$. Find this solution.

7. Use the binomial series to find a power series for the function $f(x) = \dfrac{1}{\sqrt[3]{8 - x^2}}$ and

   its radius of convergence. Please list the first three terms of the series and its radius of convergence.

8. Find the average value of the function $f(x) = e^{-x}\sin(\pi x)$ for $x \in [0,1]$.

9. $\displaystyle\int_0^1 \dfrac{x^4 - x^3 + 3x^2 - 10x + 8}{x^3 - x^2 - 4}dx =$

10. $\displaystyle\int_0^{\pi/2} \sin^2 x \cos^4 x\, dx =$