

Second Midterm

考試注意事項：

1. 答案卷上，請寫上系別，姓名，學號，及任課老師姓名。
2. 各題題號，請標示清楚。答案紙直行對折，兩直欄書寫作答。
3. 無清楚計算過程，不予計分。

試題：

1. (15%) Find the radius of convergence and the interval of convergence of $\sum_{n=1}^{\infty} \frac{x^n}{n}$.
2. (15%) Find a power series representation for $\ln(1-x)$ on $(-1, 1)$.
3. (15%) Find the Maclaurin series of $f(x) = \sin x$, and determine its interval of convergence.
4. (15%) Find $\frac{d^2y}{dx^2}$ if $x = t^2 - 4$ and $y = t^3 - 3t$.
5. (10%) Write $\mathbf{b} = 3\mathbf{i} - \mathbf{j} + 2\mathbf{k}$ as the sum of a vector parallel to $\mathbf{a} = 2\mathbf{i} - \mathbf{j} + \mathbf{k}$ and a vector perpendicular to \mathbf{a} .
6. (10%) Find the area of the triangle with vertices $P(3, -3, 0)$, $Q(1, 2, 2)$, and $R(1, -2, 5)$.
7. (10%) Find an equation of the plane containing the points $P(3, -1, 1)$, $Q(1, 4, 2)$, and $R(0, 1, 4)$.
8. (10%) Find the antiderivative of $\mathbf{r}' = \cos t \mathbf{i} + e^{-t} \mathbf{j} + \sqrt{t} \mathbf{k}$ satisfying the initial condition $\mathbf{r}(0) = \mathbf{i} + 2\mathbf{j} + 3\mathbf{k}$.