

Physics 3513, Midterm I

(1) Find the interval of convergence, including end-point tests, for $\sum_{n=1}^{\infty} \frac{(n-1)! + 1}{n!} (x-1)^n$.

(2) Find all complex z for which $\begin{vmatrix} 0 & 1 & z \\ z & 0 & 1 \\ 1 & z & 0 \end{vmatrix} = 0$.

(3) Find $\lim_{x \rightarrow 0} \frac{e^{2x} - 2e^x + e^{-x^2}}{x^3}$.

(4) Find all x for which $\lambda = 1$ is an eigenvalue of $\begin{pmatrix} x & 0 & x \\ 0 & x & 0 \\ x & 0 & x \end{pmatrix}$.

(5) Given $f(x, y) = x^2 + xy + y^2$, find $f_{xx} + f_{xy} + f_{yy}$.