

Homework 5

MATH 420

Please email me your homework as a pdf file

All working must be shown clearly. You must justify all your answers.

1. Find the region of convergence of the series

$$(a) \sum_{n=1}^{\infty} \frac{(-1)^{n-1} z^{2n-1}}{(2n-1)!} \quad (b) \sum_{n=1}^{\infty} \frac{(z+2)^{n-1}}{(n+1)^3 4^n}$$

2. Find the Maclaurin series of $f(z) = \frac{z}{z^4+9}$. Determine the region where the expansion is valid.

Hint: Write $f(z)$ as $\frac{z}{9(1+z^4/9)}$

3. Find the Taylor series expansion about $z = 1$ of $(z-1)^2 \sin \pi z$.

4. Find a Laurent series expansion of the following about $z = 0$

$$(a) \frac{1}{z^2} e^{z^3}, \quad (b) \frac{1}{z^2(1-z)}$$

Indicate the region where the expansion you found is valid.

5. Find a Laurent series expansion of $\frac{1}{z(z-1)^2}$ about $z = 1$.