

1. Find the Maclaurin series expansion of each function.

(a) $f(z) = \frac{z}{4 + z^2}$

(b) $f(z) = z \sinh z^2$

2. Obtain the Taylor series representation of $f(z) = e^z$ centered at $z_0 = -1$.

3. Find the Laurent series expansion centered at $z_0 = 0$ that represents the function

$$f(z) = z^3 \cosh\left(\frac{1}{z}\right)$$

4. Find the three possible Laurent series expansion centered at $z_0 = 0$, of

$$f(z) = \frac{z}{(z - 1)(z - 3)}$$

5.(Extra credit) Repeat problem 4 when $z_0 = -1$, and for the function

$$f(z) = \frac{z}{(z - 1)^2(z - 3)}$$