
Show all work. 10 points each.

1 Find all the Residue of $f(z) = \frac{\sin(z^2)}{(z+1)^2 z^3}$. What are the order of the poles?

2 Find a Laurent series for $f(z) = \frac{1}{(z-1)^2(z-3)}$ for the annulus $0 < |z-1| < 2$.
Hint $(z-3) = -2 + (z-1)$.