

# Homework # 8

MATH 3160 – Complex Variables  
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## Problem 1

Find the Taylor series expansion at  $z_0 = 0$  of the function

$$f(z) = \frac{z}{z^4 + 9} = \frac{z}{9} \cdot \frac{1}{1 + \left(\frac{z^4}{9}\right)}$$

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**Problem 2**

Find the Taylor series expansion of

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

at the following points, if it exists (or say it doesn't exist if the series diverges).

- (a)  $z = 0$
  - (b)  $z = 1$
  - (c)  $z = 2$
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**Problem 3**

Derive the Laurent series representation of

$$f(z) = \frac{e^z}{(z+1)^2}$$

about the point  $z_0 = -1$ .

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**Problem 4**

Represent the function

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

- (a) By a Taylor series at  $z_0 = 0$  and state its domain of convergence.
  - (b) By a Laurent series about  $z_0 = 1$ .
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