

MATH 417 HOMEWORK 2

You may collaborate on the homework. However, the final write-up must be yours and should reflect your own understanding of the problem. Please be sure to properly cite any help you get.

Problem 1 Find the real and imaginary parts of the following complex functions

(1) $5z^3 + 3z^2 + 7z + 2$

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

Problem 2 Find the image of the semi-infinite strip $x \geq 0, 0 \leq y \leq \pi$ under the map $w = \exp(z)$.

Problem 3 Prove that a polynomial

$$a_n z^n + a_{n-1} z^{n-1} + \cdots + a_1 z + a_0$$

is a continuous function on the entire complex plane.

Problem 4 Show that

(1) $\lim_{z \rightarrow 2} \frac{4}{z-2} = \infty$

(2) $\lim_{z \rightarrow \infty} \frac{3z^2}{(z-5)^2} = 3$

Problem 5 Find the derivatives of the following functions

(1) $p(z) = a_n z^n + a_{n-1} z^{n-1} + \cdots + a_1 z + a_0$

(2) $f(z) = \frac{(1+z^3)^2}{(2z+1)}, \quad z \neq -\frac{1}{2}$