

Math 3X03 / First assignment: due January 24th in class.

Problem # 1:

(a) Let $\omega \neq 1$ be an n -th root of unity. Show that $1 + \omega + \omega^2 + \cdots + \omega^{n-1} = 0$.

Hint: Verify (and use) the identity $(1 - \omega)(1 + \omega + \omega^2 + \cdots + \omega^{n-1}) = 1 - \omega^n$.

(b) Use (a) (and its hint) to evaluate $1 + 2\omega + 3\omega^2 + \cdots + n\omega^{n-1}$, when $\omega \neq 1$ is an n -th root of unity.

Problem # 2: Sketch the image by $f(z) = z^{-3}$ of the polar region given by :
 $1/2 \leq r \leq 1$ and $0 \leq \theta \leq \frac{\pi}{4}$.

Problem # 3: 8th edition and 9th edition: page 55/56 # 9

These are good problems to work on alongside this assignment. They will be presented in tutorials (but not graded.)

Problem # 4: Show that the lines $ay = x$ ($a \neq 0$) are mapped onto the spirals $\rho = \exp(a\phi)$ under the transformation $w = \exp z$, where $w = \rho \exp(i\phi)$.

Problem # 5: 8th edition and 9th edition: page 62/63 # 9