

1. Compute the limit

$$\lim_{z \rightarrow \infty} \frac{3iz + 1}{2z - 5i}$$

2. Show that $\lim_{z \rightarrow 0} \left(\frac{z}{\bar{z}}\right)^2$ doesn't exist, by first considering z approaching 0 along real-axis, then along the line $y = x$.
3. $f(z) = z^2$. Compute $f'(z)$ by definition.
4. Show that $f(z) = \operatorname{Re}(z)$, i.e. the function sending each complex number to its real part, is not differentiable at any point $z \in \mathbb{C}$.
5. f is a complex function defined in a neighbourhood of $z \in \mathbb{C}$. If f is differentiable at z , prove it is continuous at z .