

1. Compute the limit

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

2. Show that  $\lim_{z \rightarrow 0} (\frac{z}{\bar{z}})^2$  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  $z$ .