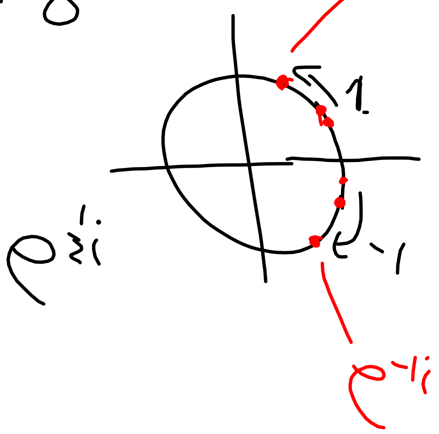
$S_1 = \{z \in \mathbb{C} : |z| < 4\} \cup \{z \in \mathbb{C} : |z| = 4 \text{ and } \underbrace{\operatorname{Im} z \geq 0}\}$

OR $0 \leq \operatorname{Arg} z \leq \pi$

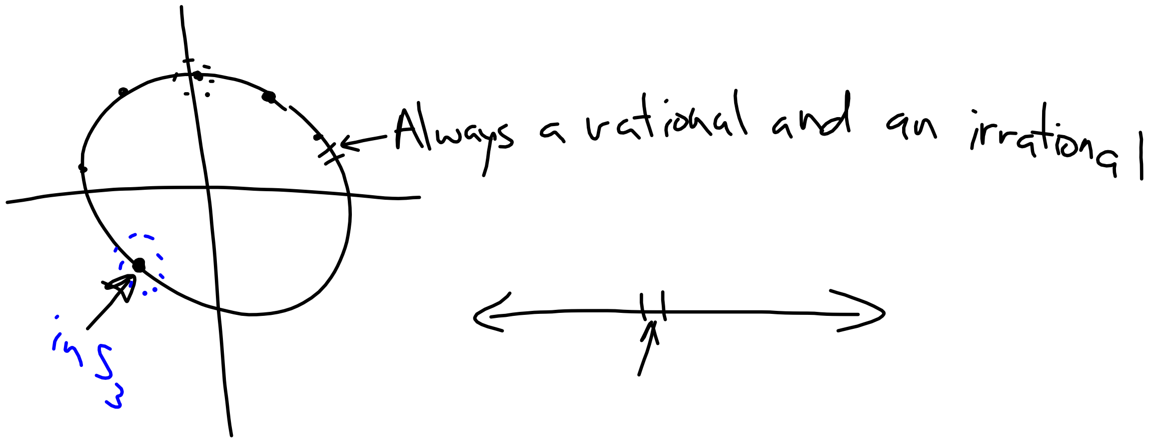
$\{e^{\frac{1}{n}i} : n = \mathbb{Z} \setminus \{0\}\}$

#8

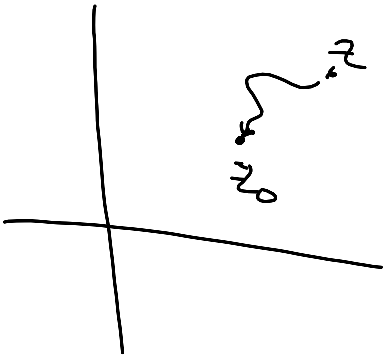


$z = \underline{1}\, e^{1i}$

9. $S_3 = \{e^{\theta i} : \theta \in \mathbb{Q}\}$



Limits of functions in $\mathbb{C}$



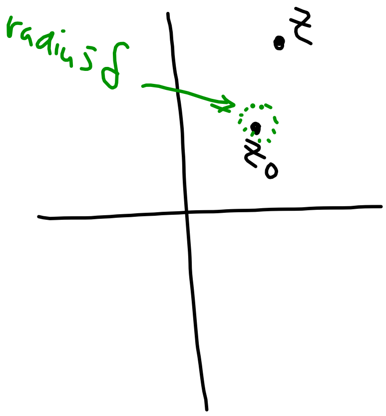
$$\lim_{\substack{z \to z_0 \\ z \neq z_0}} f(z) = c$$ complex #

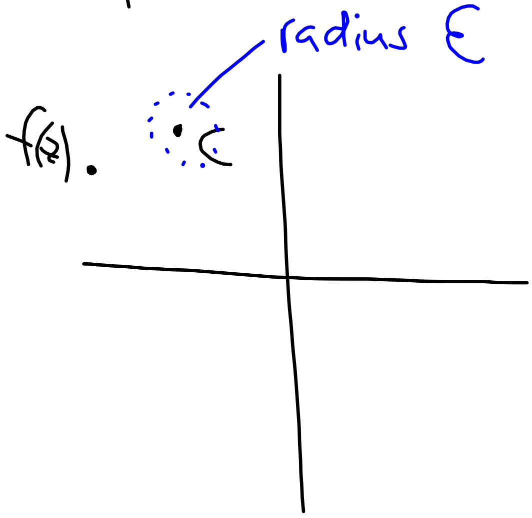
$f(z) \to c$ as $z \to z_0$

We can make $f(z)$ as close to c as we want by making z sufficiently close to z_0

$\lim_{z \to z_0} f(z) = c$ if

given $\varepsilon > 0$, there exist a $\delta > 0$ such that $|f(z) - c| < \varepsilon$ whenever $|z - z_0| < \delta$.





<u>Derivatives</u> f is differentiable at z_0 if

$$f'(z_0) = \lim_{z \to z_0} \frac{f(z)-f(z_0)}{z-z_0}$$ exists. $f'(z_0)$ is the derivative at z_0.

* differentiation is a pointwise characteristic.
* Two questions
  * differentiable at z_0?
  * derivative?

Yes if, for $f(z)=u(x,y)+iv(x,y)$, $u_x(x,y)$ and $v_y(x,y)$ are continuous at $z_0 = x_0+iy_0$ and

$$\underbrace{u_x(x_0,y_0) = v_y(x_0,y_0) \text{ and } u_y(x_0,y) = -v_x(x_0,y_0)}_{\text{Cauchy-Riemann equations}}$$

1. Turn in Assignment 4 today by 4:00.

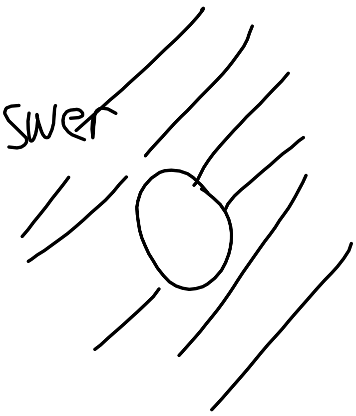
2. Turn in Assignment 3 plus this: $(2-13x-5x^2+x^3)\div(2+x)$ tomorrow

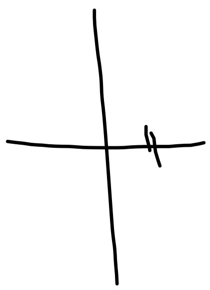
$$
\begin{array}{r|l}
 & 1 \\
\hline
2+x & 2-13x-5x^2
\end{array}
$$

1(f) $\underbrace{|z-4|}\geq\underbrace{|z|}$

4(c) $\mathrm{Re}\left(\frac{1}{z}\right)\leq\frac{1}{2}$

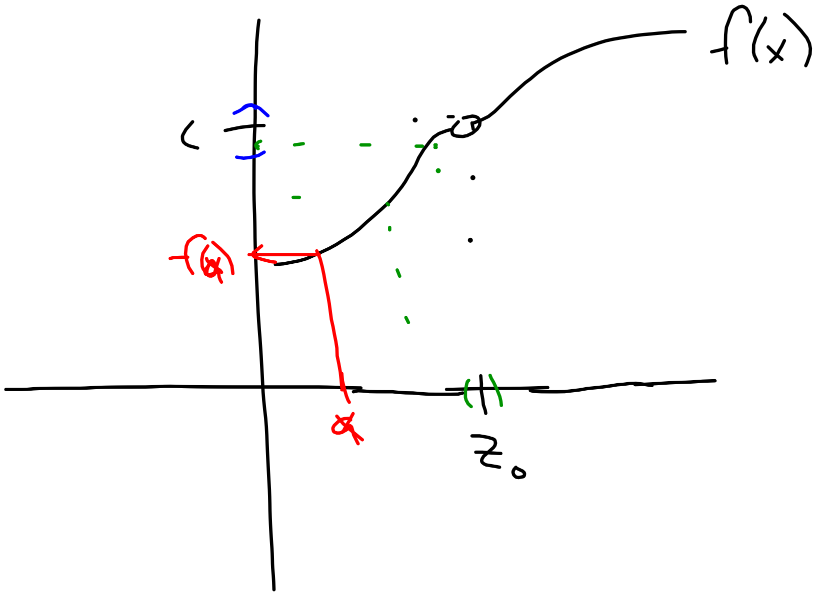
Answer





$(x,y)\leq\frac{1}{2}$

Let $x=0$


f(x)
c
f(α)
α
z_0