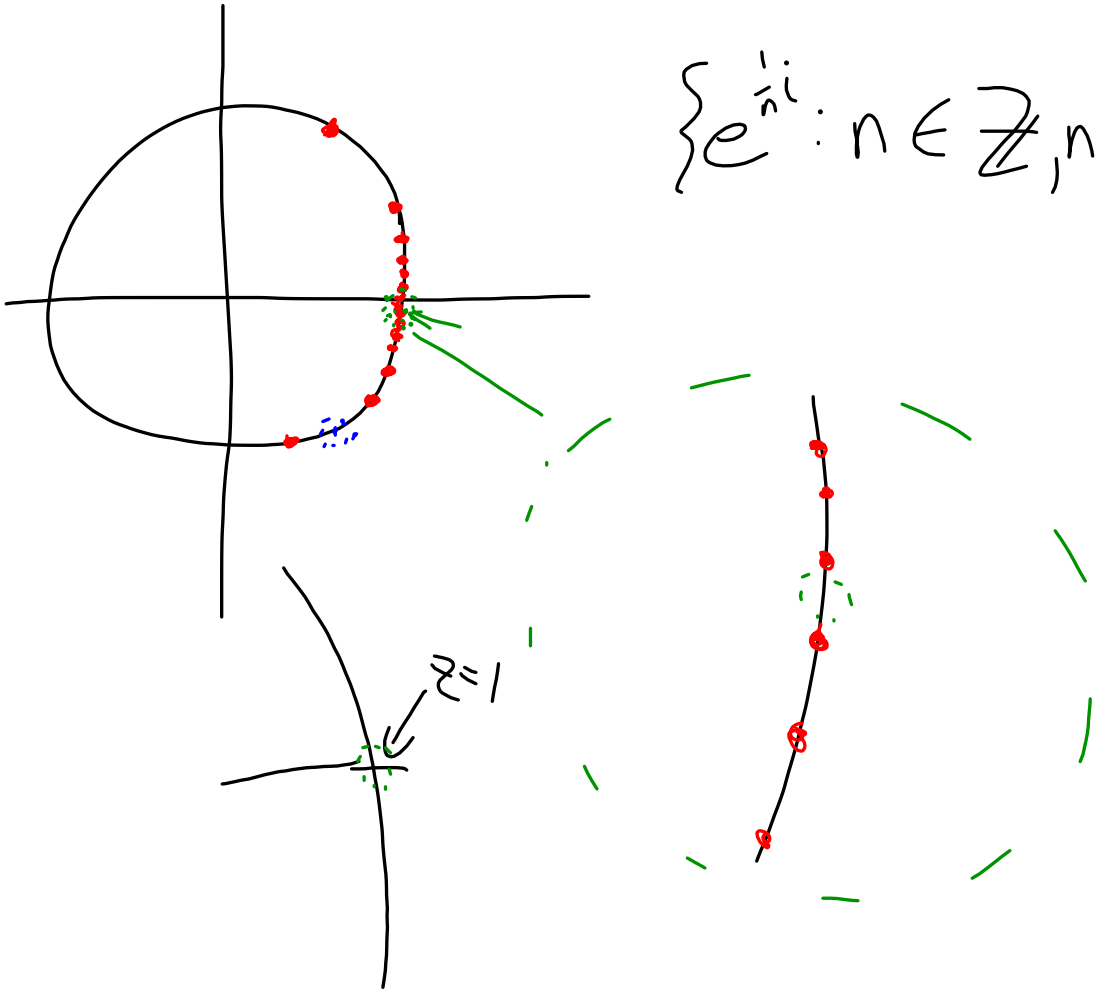
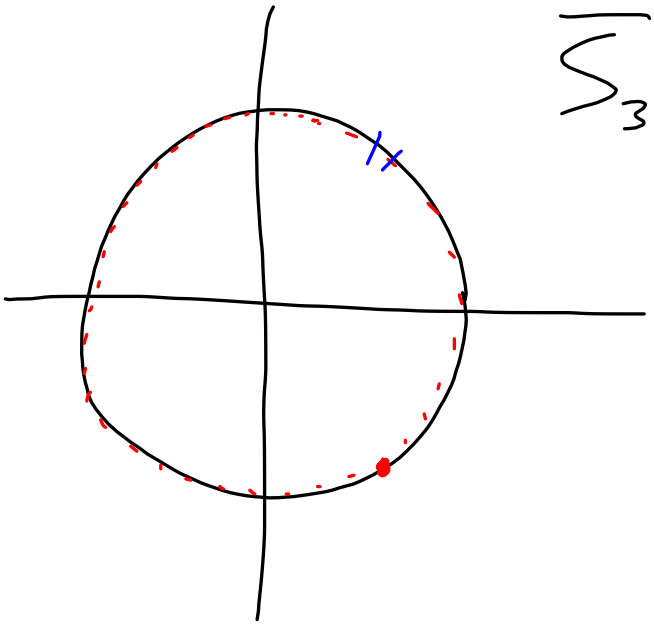
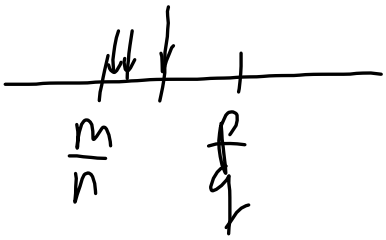
$\{e^{\frac{1}{n}i} : n \in \mathbb{Z}, n \neq 0\}$





$$S_3 = \{ z : |z| = 1 \}$$

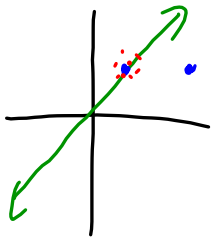


$f(z) = z^2$ differentiable for all $z \in \mathbb{C}$.

$f(z) = \frac{1}{z}$ differentiable for all $z \in \mathbb{C}$ except $z = 0$.

$f(z) = \frac{1}{(z-3)(z+2)}$

$f(z) = x^2 + iy^2$ Differentiable where $y = x$.



① f is differentiabl at z_0 if ... as before

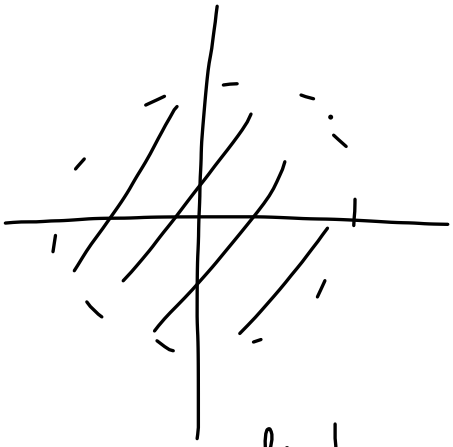
② f is holomorphic at z_0 if f is differentiable in an ε-neighborhood of z_0

③ f is entire if it is holomorphic at ever $z \in \mathbb{C}$.

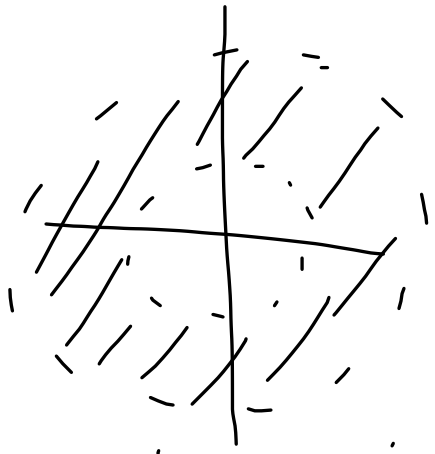
f is holomorphic at z_0 ⇓ differentiable everywhere in some ε-neighborhood of z_0

f is analytic at z_0 ⇓ f has a power series representation in some ε-neighborhood of z_0

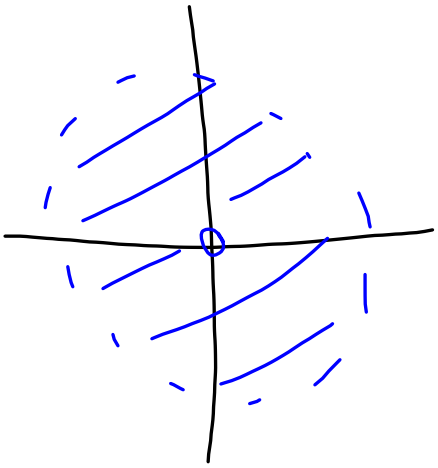
$$f(z) = a_0 + a_1(z-z_0) + a_2(z-z_0)^2 + a_3(z-z_0)^3 + \cdots$$



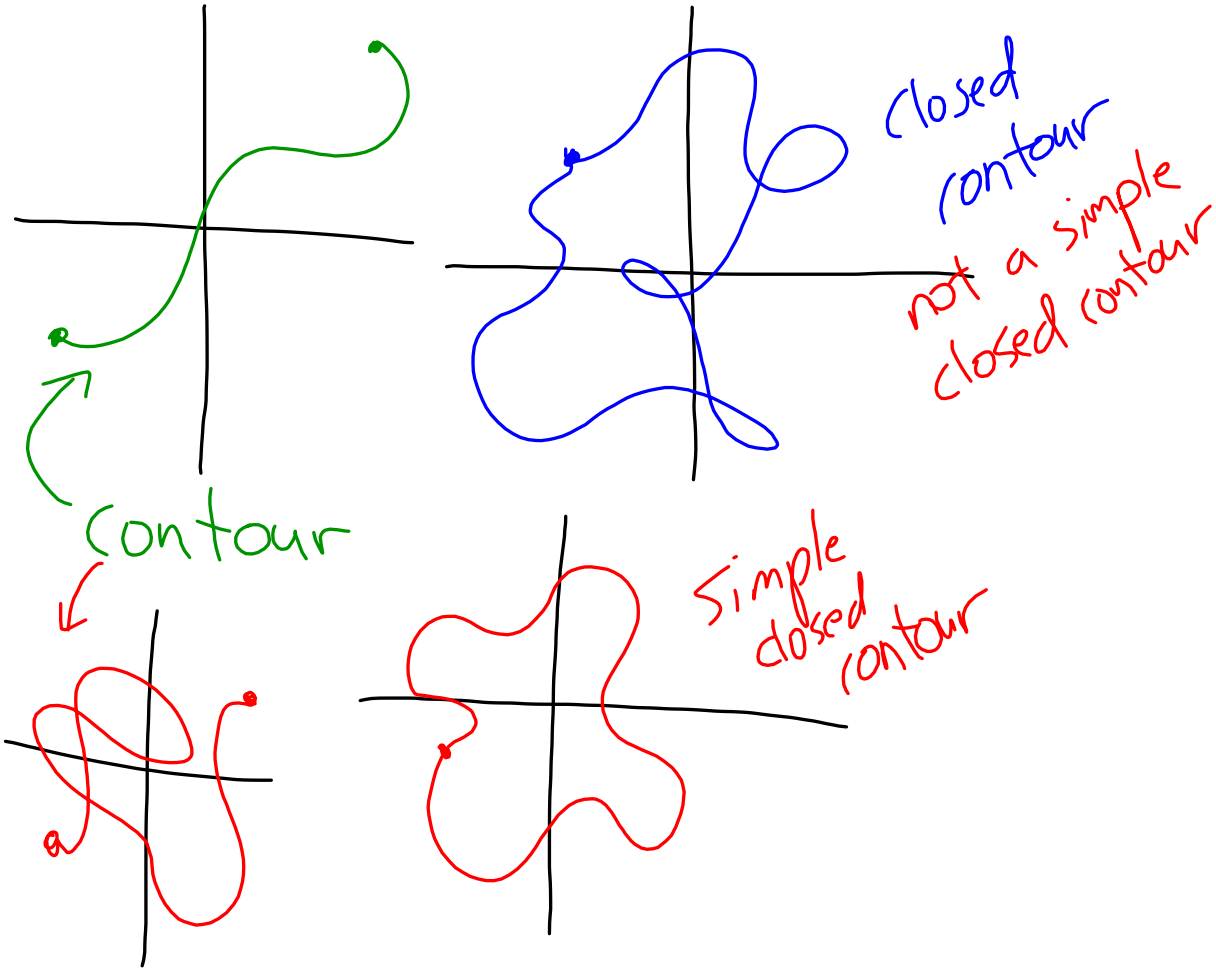
open disk



annular region



punctured disk


closed contour
not a simple closed contour
contour
simple closed contour

$$
\begin{array}{r|l}
 & 1 \\
\hline
1-x & 1 \\
 & \underline{1-x} \\
 & \quad x
\end{array}
$$