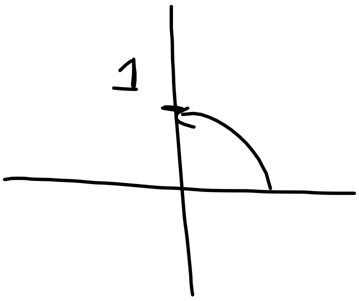
$$(iz)^3 = (iz)(iz)(iz) = -iz^3$$

$i^1 = i$

$i^2 = -1$

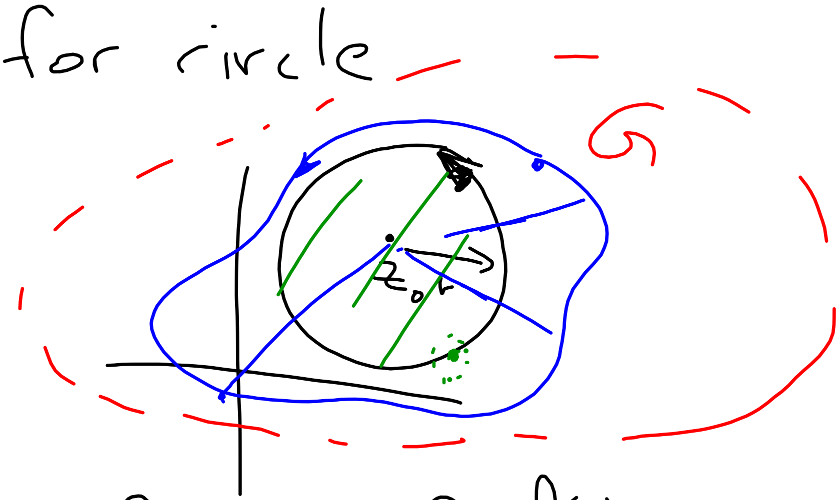
$i^3 = -i$

$i^4 = 1$

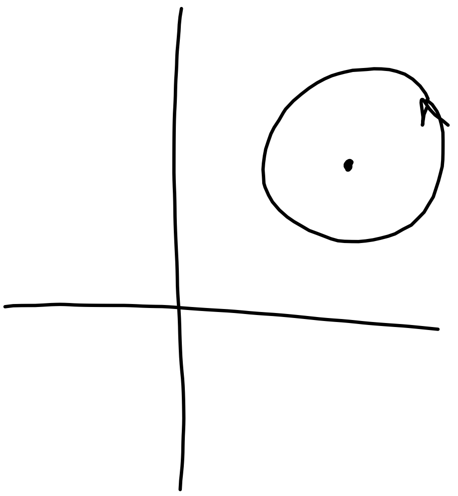


CIF for circle

(Cauchy's Integral Formula)



$$f(z_0) = \frac{1}{2\pi i} \int_{C_r(z_0)} \frac{f(z)}{z - z_0}\, dz$$



$z_0 + re^{i\theta}$

$$\frac{z+5}{z^2+4z+3} = \frac{A}{z+3} + \frac{B}{z+1}$$

$(z+3)(z+1)$

$$z+5 = A(z+1) + B(z+3)$$

$z+5 = (A+B)z + (A+3B)$

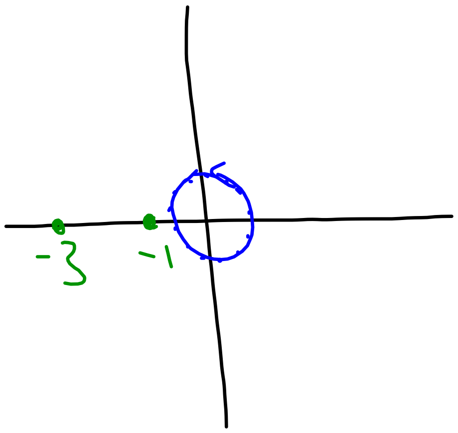
$A+B=1$

$A+3B=5$

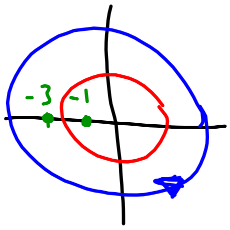
let $z=-1$: $4=2B \Rightarrow B=2$

$z=-3$: $2=-2A \Rightarrow A=-1$

$$\int_{C_{\frac{1}{2}}(0)} \frac{z+5}{\underbrace{z^2+4z+3}_{(z+3)(z+1)}}\,dz = 0 \text{ by Cor. 4.10}$$



$$\int_{C_5(0)} \frac{z+5}{z^2+4z+3}\,dz = \int_{C_5(0)} \frac{-1}{z+3}\,dz + \int_{C_5(0)} \frac{2}{z+1}\,dz$$

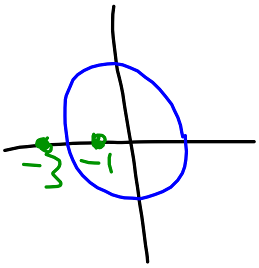


$$= 2\pi i(-1) + 2\pi i(2) = 2\pi i$$

CIF $\quad f(z_0) = \frac{1}{2\pi i}\int \frac{f(z)}{z-z_0}\,dz \Rightarrow 2\pi i\, f(z_0) = \int \frac{f(z)}{z-z_0}\,dz$

$$f(z)\Big|_{z=z_0}$$

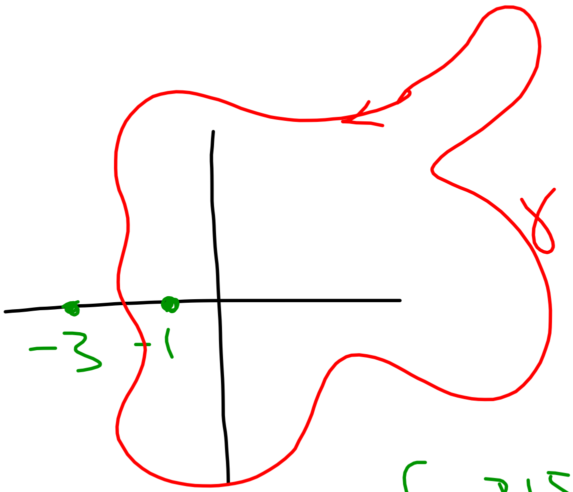
$$\int_{C_2(0)} \frac{z+5}{z^2+4z+3}\,dz = \int_{C_2(0)} \frac{z+5}{(z+3)(z+1)}\,dz$$



$$= \int_{C_2(0)} \frac{\overbrace{(z+5)/(z+3)}^{f(z)}}{z+1}\,dz \qquad z_0=-1$$

$$= 2\pi i \cdot \left.\frac{z+5}{z+3}\right|_{z=-1}$$

$$= 2\pi i \cdot \frac{4}{2} = 4\pi i$$



$$\int_\gamma \frac{z+5}{z^2+4z+3}\,dz = 4\pi i$$

$$\int_\gamma \frac{z+5}{z^2+4z+3}\,dz = 2\pi i\, f(-1)$$

$$\int \frac{f(z)}{z+1}\,dz$$

$$\frac{1}{z-i} = \frac{1}{-i+z} = \qquad a\left(\frac{1}{1-r}\right)$$

$$\begin{array}{r|l} & i \\ \hline -i+z & 1 \\ & \underline{1+iz} \\ & -iz \end{array}$$