grade_school_Last_first.pdF

$$(r_1 \operatorname{cis}\theta_1)(r_2 \operatorname{cis}\theta_2) = r_1 r_2 \operatorname{cis}(\theta_1+\theta_2)$$

$$(r_1\cos\theta_1 + r_1 i\sin\theta_1)(r_2\cos\theta_2 + r_2 i\sin\theta_2)$$

$$r_1\cos\theta_1 r_2\cos\theta_2 + r_1\cos\theta_1 r_2 i\sin\theta_2$$
$$+ r_1 i\sin\theta_1 r_2\cos\theta_2 + r_1 i\sin\theta_1 r_2 i\sin\theta_2$$

$$r_1 r_2(\cos\theta_1\cos\theta_2 + \cos\theta_1 i\sin\theta_2$$
$$+ i\sin\theta_1\cos\theta_2 - \sin\theta_1\sin\theta_2)$$

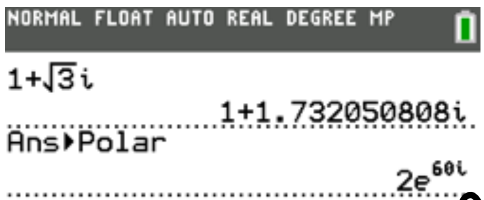
$$r_1 r_2(i(\sin\theta_1\cos\theta_2 + \cos\theta_1\sin\theta_2)$$
$$+ (\cos\theta_1\cos\theta_2 - \sin\theta_1\sin\theta_2)$$

$$r_1 r_2(i\sin(\theta_1+\theta_2) + \cos(\theta_1+\theta_2))$$

$$(r_1 r_2)(\operatorname{cis}(\theta_1+\theta_2))$$

$1+\sqrt{3}\,i \rightarrow 2 \text{ cis } 60^\circ$

$2\cos 60^\circ + 2i\sin 60^\circ$



$r \text{ cis}\theta = re^{\theta i}$ * will be proven in 1yr.

$(r_1 \text{ cis}\theta_1)(r_2 \text{ cis}\theta_2)$

$= r_1 e^{\theta_1 i} \cdot r_2 e^{\theta_2 i} = r_1 r_2 e^{\theta_1 i + \theta_2 i}$

$= r_1 r_2 e^{(\theta_1 + \theta_2) i}$

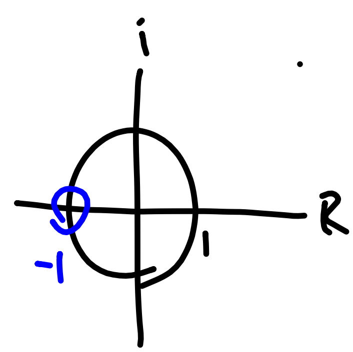
$= r_1 r_2 \text{ cis}(\theta_1 + \theta_2)$

$$\frac{r_1 \operatorname{cis}\theta_1}{r_1 \operatorname{cis}\theta_2} = \frac{r_1 e^{\theta_1 i}}{r_2 e^{\theta_2 i}} = \frac{r_1}{r_2} e^{(\theta_1-\theta_2)i}$$

$$= \frac{r_1}{r_2} \operatorname{cis}(\theta_1-\theta_2)$$

$$\frac{1}{r_1 \operatorname{cis}\theta_1} = \frac{1 \operatorname{cis} 0}{r_1 \operatorname{cis}\theta_1}$$

$$= \frac{1}{r_1} \operatorname{cis}(-\theta_1)$$



$$e^{\pi i} = 1 \operatorname{cis}\pi = -1$$

$$e^{\pi i} + 1 = 0$$

$$(3 \text{ cis } 30^\circ)^2 = 9 \text{ cis } 60^\circ$$

$$\left(\frac{1}{2} + \frac{\sqrt{3}}{2} i\right)^6 = 1$$

$$(1 \text{ cis } 60^\circ)^6 = 1^6 \text{ cis}(60^\circ \cdot 6) = 1 \text{ cis } 0$$

$$= 1$$

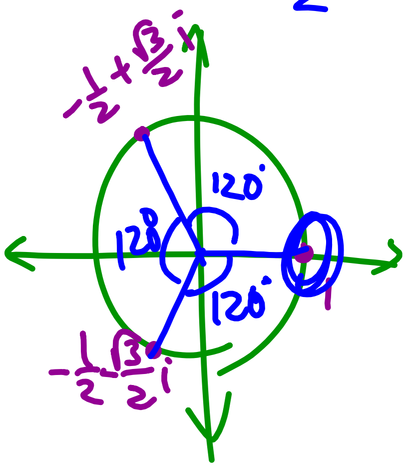
$$\sqrt{i} = \frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} i$$

$$\sqrt{1 \text{ cis } 90^\circ} = 1 \text{ cis } 45^\circ$$

$x^3 - 1 = 0$ Find x.

$(x-1)(x^2+x+1)=0$

$1, \quad \dfrac{-1 \pm \sqrt{3}\,i}{2}$



$x^3 = 1$

$x = \sqrt[3]{1}$

$\sqrt[3]{1 \operatorname{cis} 0} = 1 \operatorname{cis} 0 = 1$

$\sqrt[3]{1 \operatorname{cis} 360°} = 1 \operatorname{cis} 120° = -\frac{1}{2} + \frac{\sqrt{3}}{2}i$

$\sqrt[3]{1 \operatorname{cis} 720°} = 1 \operatorname{cis} 240° = -\frac{1}{2} - \frac{\sqrt{3}}{2}i$

$x^6 - 1 \rightarrow$ factor

* $x^6 = 1$

$(x-1)\left(x - \frac{1}{2} - \frac{\sqrt{3}}{2}i\right)$

$\left(x + \frac{1}{2} - \frac{\sqrt{3}}{2}i\right)$

...