Precalc 12.7

Approximate ex, trig values, and logs by using series
Use Euler's formula to write the exponential form of a complex number

exponential series

trigonometric series (radians)

Euler's formula

a + bi = rcisΘ... put into polar form

Euler's Formula	$e^{i\alpha} = \cos\alpha + i\sin\alpha$

$a + bi = r(\cos\theta + i\sin\theta)$

$= re^{i\theta}$

polar → $re^{i\theta}$

ole **4** **Write $1 + \sqrt{3}i$ in exponential form.**

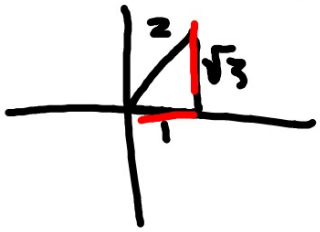
$1^2 + \sqrt{3}^2 = h^2$

$1 + 3 = h^2$

find r, Θ

answer the question

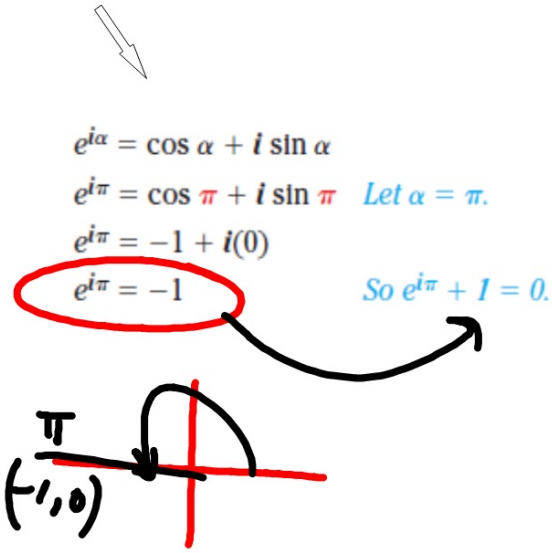
$4 = h^2$



$2\text{cis}\,60^\circ = 2\text{cis}\,\frac{\pi}{3}$

$2e^{\frac{\pi}{3}i} = 2e^{i\frac{\pi}{3}}$

Euler's formula



$$e^{i\alpha} = \cos\alpha + i\sin\alpha$$

$$e^{i\pi} = \cos\pi + i\sin\pi \quad \textit{Let } \alpha = \pi.$$

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

$$e^{i\pi} = -1 \quad \textit{So } e^{i\pi} + 1 = 0.$$

Wow, 3 of the most important numbers in one expression!

Wow, something real can = something imaginary! Mind blown!

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

$\ln e^{i\pi} = \ln(-1)$

$i\pi = \ln(-1)$

WB 12.7

5 **Evaluate ln (−270).**

e

$\ln(270)(-1)$

$\ln(270) + \ln(-1)$

$\ln(270)(-1)$

$\ln 270 + \ln(-1)$

$5.5984 + i\pi$

πi