

$$i = \sqrt{-1}$$

8/31  
p. 1

$$3 + 4i$$

$$2 - i$$

$$7 + 5i$$

$$(3 + 4i) + (2 - i) = 5 + 3i$$

$$\begin{aligned}(3 + 4i)(2 - i) &= 6 - 3i + 8i + 4i(-i) \\ &= 6 + 5i + 4 = 10 + 5i\end{aligned}$$

$$\frac{1}{1 + \sqrt{3}} \quad \frac{1 - \sqrt{3}}{1 - \sqrt{3}}$$

$$\frac{1}{3 + 4i} \cdot \frac{3 - 4i}{3 - 4i} = \frac{3 - 4i}{9 + 16 \cancel{+12i} + \cancel{+16i}}$$

$$= \frac{3 - 4i}{25} = \frac{3}{25} + \frac{-4}{25} i$$

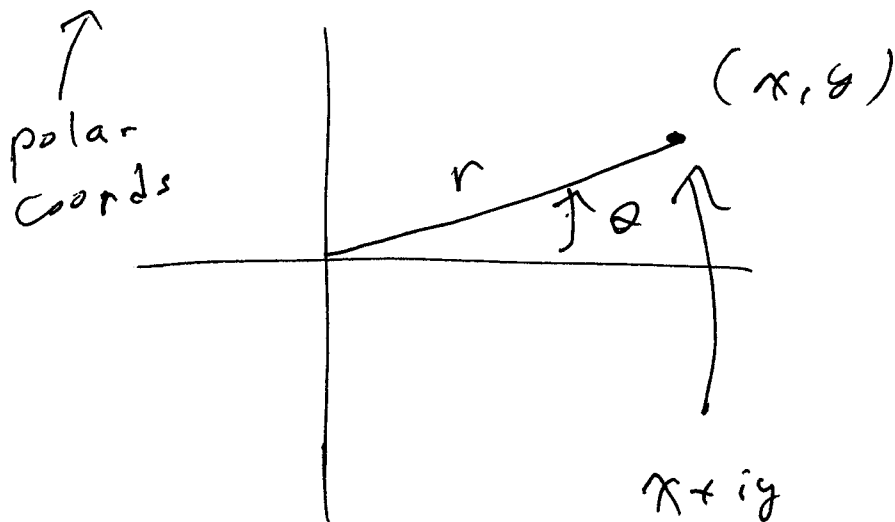
# Euler's formula

8(31)  
p. 2

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

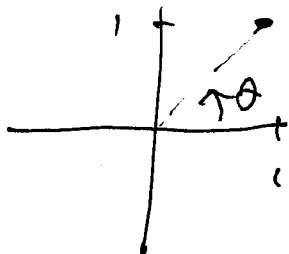
$$\begin{aligned} e^{a+ib} &= e^a e^{ib} \\ &= e^a [\cos b + i \sin \theta] \end{aligned}$$

$$\begin{aligned} r e^{i\theta} &= r \cos \theta + ir \sin \theta \\ &= x + iy \end{aligned}$$



$$\begin{aligned} x &= r \cos \theta \\ y &= r \sin \theta \end{aligned}$$

$1 + i$



$$r = \sqrt{2}$$

$$\theta = \frac{\pi}{4}$$

$$1 + i = \sqrt{2} e^{i\pi/4}$$

$$1+i = \sqrt{2} e^{i\pi/4}$$

8(31)  
p. 3

$$\sqrt{1+i} = \sqrt{\sqrt{2}} \sqrt{e^{i\pi/4}}$$

$$= 2^{1/4} e^{i\pi/8}$$

$$= 2^{1/4} \left[ \cos \frac{\pi}{8} + i \sin \frac{\pi}{8} \right]$$

$$= 2^{1/4} \cos \frac{\pi}{8} + i 2^{1/4} \sin \frac{\pi}{8}$$