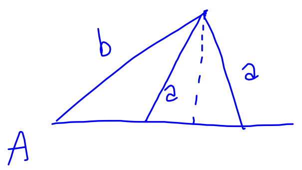
Law of Sines.

Look for 2-solution triangles.



Law of cosines SAS

Area of obtuse triangle

3.3 Vectors. Magnitude, Sum, Linear Combos!

Sum → Resultant → $\bar{u}+\bar{v}$

Linear Combos → $2\bar{u}-\bar{v}$

4.1 Complex #s $z = 3+2i$, $w = 7-5i$

zw

$z+w$

$z+\bar{z}$

$z\bar{z}$

4.2 Let $P(x) = 13x^5 - 5x^4 + 7x^2 - 11x + 1$

Use synthetic division to find $P(3)$

$$\begin{array}{r|rrrrrr} 3 & 13 & -5 & 0 & 7 & -11 & 1 \\ & & 39 & 102 & 306 & 939 & 2784 \\ \hline & 13 & 34 & 102 & 313 & 928 & \boxed{2785 = P(3)} \end{array}$$

$$\begin{array}{r} 3 \\ \times\ 928 \\ \hline 2784 \end{array}$$

Remainder Theorem

This work says

$P(x) = (x-3)(13x^4 + 34x^3 + 102x^2 + 313x + 928) + 2785$

Find all zeros of, given $x=5$ is a zero.

$P(x) = 4x^3 - 32x^2 + 73x - 65$

$$\begin{array}{r|rrrr} 5 & 4 & -32 & 73 & -65 \\ & & 20 & -60 & 65 \\ \hline & 4 & -12 & 13 & 0 \end{array}$$

This says $P(x) = (x-5)(4x^2 - 12x + 13)$

$4x^2-12x+13$ → Depressed Polynomial.

$4x^2-12x+13=0$

$a=4,\ b=-12,\ c=13$

$b^2-4ac=(-12)^2-4(4)(13)$

$=144-208$

$=-64 \longrightarrow \sqrt{-64}=i\sqrt{64}=8i$

$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}=\dfrac{12\pm 8i}{2(4)}=\dfrac{\cancel{4}(3\pm 2i)}{2(\cancel{4})}=\dfrac{3\pm 2i}{2}$

$5,\ \dfrac{3\pm 2i}{2}$

Split $P(x)$ into linear factors:

$$\boxed{P(x)=4(x-5)\left(x-\left(\frac{3+2i}{2}\right)\right)\left(x-\left(\frac{3-2i}{2}\right)\right)}$$

$4x^3+\ldots$

Show that

$\boxed{x^2-x-6=0}$

$(x-3)(x+2)$

$x\in\{-2,3\}$

$(x-(-2))(x-3)$

$(2x+1)(3x-5)$

$=\boxed{6x^2-7x-5}$

$x\in\{-\frac{1}{2},\ \frac{5}{3}\}$

$6(x-(-\frac{1}{2}))(x-\frac{5}{3})$

$3\cdot 2(x+\frac{1}{2})(x-\frac{5}{3})$

$2(x+\frac{1}{2})(3)(x-\frac{5}{3})$

$(2x+1)(3x-5)$

Show that $2+i$ is a root of

$f(x) = 4x^3 - 19x^2 + 32x - 15$

We divide $f(x)$ by $x-(2+i)$

$$\begin{array}{c|cccc} 2+i & 4 & -19 & 32 & -15 \\ & & 8+4i & -26-3i & 15 \\ \hline & 4 & -11+4i & 6-3i & 0 \end{array}$$

#2

$(2+i)(-11+4i)$

$= -22+8i-11i+4i^2$

$= -22-3i-4$

$= -26-3i$

$(2+i)(6-3i) = 12-6i+6i-3i^2$

$= 12+3 = 15$ #1

Write $\frac{1}{2+3i}$ in standard form

$5+7i$

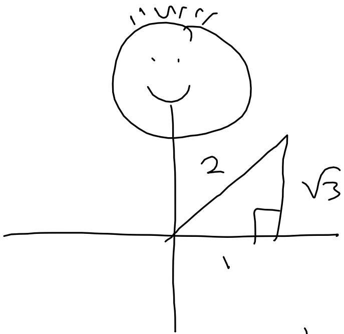
$= \left(\frac{1}{2+3i}\right)\left(\frac{2-3i}{2-3i}\right) = \frac{2-3i}{2^2+3^2} = \frac{2}{13} - \frac{3}{13}i$

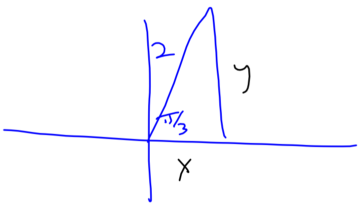
Convert to trig form

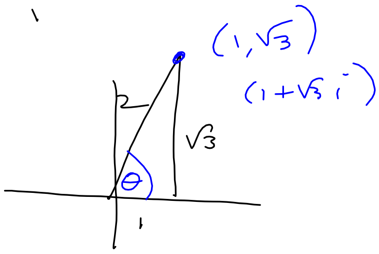
$1+\sqrt{3}\,i$

$2\left(\cos\left(\frac{\pi}{3}\right)+i\sin\left(\frac{\pi}{3}\right)\right)$

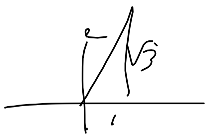
Convert to stdd form







$\frac{y}{2}=\sin\frac{\pi}{3}$ $\qquad$ $\frac{x}{2}=\cos\frac{\pi}{3}$



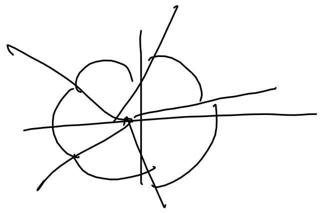
$y=2\sin\frac{\pi}{3}$ $\qquad$ $x=2\cos\frac{\pi}{3}$

$=2\cdot\frac{\sqrt{3}}{2}=\sqrt{3}$ $\qquad$ $=2\cdot\frac{1}{2}=1$

$\boxed{1+\sqrt{3}\,i}$

$z = r(\cos\theta + i\sin\theta)$

$z^n = r^n(\cos(n\theta) + i\sin(n\theta))$



Find all solutions to

$z^5 = 32$

$\sqrt[5]{(z^5)} = \sqrt[5]{32}$

$\boxed{z = 2}$ = principal 5^{th} root.

$z^5 = 32\left(\cos\frac{\pi}{3} + i\sin\frac{\pi}{3}\right)$

$\sqrt[5]{z^5} = z = \sqrt[5]{32}\left(\cos\left(\frac{\pi}{15}\right) + i\sin\left(\frac{\pi}{15}\right)\right)$

$\frac{2\pi}{5}$

$z = 2\left(\cos\left(\frac{7\pi}{15}\right) + i\sin\left(\frac{7\pi}{15}\right)\right)$

$\frac{\pi}{15} + \frac{2\pi}{5} = \frac{7\pi}{15}$

$2\left(\cos\left(\frac{7\pi}{15}\right) + i\sin\left(\frac{7\pi}{15}\right)\right)\left(\cos\frac{2\pi}{5} + i\sin\frac{2\pi}{5}\right)$

$2\left(\cos\left(\frac{13\pi}{15}\right) + i\sin\left(\frac{13\pi}{15}\right)\right)$

$\frac{7\pi}{15} + \frac{6\pi}{15}$