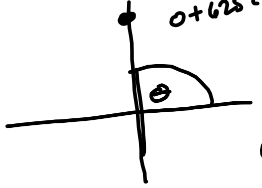
$625i$

$(0, 625)$

$0 + 625i$



$\theta = \frac{\pi}{2}$

4th roots: $\frac{2\pi}{4} = \frac{\pi}{2}$

$6+2+5=13$ Nope

$$\begin{array}{r|l} 5 & 625 \\ 5 & 125 \\ 5 & 25 \\ & 5 \end{array}$$

$625 = 5^4$

$\sqrt[4]{625} = 5$

$k=0 \quad \frac{\pi}{4} + \frac{2\pi}{4}\cdot 0 = \frac{\pi}{4}$

$5\left(\cos\left(\frac{\pi}{4}\right) + i\sin\left(\frac{\pi}{4}\right)\right) = \sqrt[4]{625i}$

$\frac{\pi}{4} + \frac{2\pi}{4} = \frac{3\pi}{4} \qquad 5\left(\cos\left(\frac{3\pi}{4}\right) + i\sin\left(\frac{3\pi}{4}\right)\right)$

$\frac{3\pi}{4} + \frac{2\pi}{4} = \frac{5\pi}{4} \qquad 5\left(\cos\left(\frac{5\pi}{4}\right) + i\sin\left(\frac{5\pi}{4}\right)\right)$

$5\left(\cos\left(\frac{7\pi}{4}\right) + i\sin\left(\frac{7\pi}{4}\right)\right)$

$5\left(\cos\left(\frac{9\pi}{4}\right) + i\sin\left(\frac{9\pi}{4}\right)\right) = 5\left(\cos\left(\frac{\pi}{4}\right) + i\sin\left(\frac{\pi}{4}\right)\right)$

$z = a + bi$

$|z|$ = Absolute value = Modulus

$|z| = \sqrt{z\bar{z}} = \sqrt{a^2+b^2} \qquad (\bar{z} = a - bi)$

$\|\vec{v}\| = \sqrt{\vec{v}\cdot\vec{v}} = \sqrt{a^2+b^2}$, if $\vec{v} = \langle a, b\rangle = a\vec{i} + b\vec{j}$

$\sqrt{-90}$

$$\begin{array}{r|l} 2 & 90 \\ 3 & 45 \\ 3 & 15 \\ & 5 \end{array}$$

$4+5=9$

$\sqrt{-90} = 3\sqrt{10}\, i$

$(4-3i)^2 = 16 - 2(4)(3)i + (-3i)^2 = 16 - 24i + 9i^2 = 7 - 24i$

$i^2 = -1$, $9i^2 = -9$

$\left(\frac{6+i}{6-i}\right)\left(\frac{6+i}{6+i}\right) = \frac{36 + 2(6)(i) + i^2}{36+1} = \frac{36+12i-1}{37} = \frac{35}{37} + \frac{12}{37}i$

$\frac{12i}{37}$

$4x^2 + 16x + 7 = 0$ (7 → 17)

$a=4, b=16, c=7$ (7 → 17)

Discriminant

$b^2 - 4ac = 16^2 - 4(4)(7) = 256 - 112 = 144$

$4 \cdot 16 \cdot 7 = 112$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a} = \frac{-16 \pm \sqrt{144}}{8}$

$4x^2 + 16x + 17 = 0$

$a=4, b=16, c=17$

$b^2 - 4ac = 16^2 - 4(4)(17) = 256 - 272 = -16 \rightsquigarrow \sqrt{-16} = 4i$

$x = \frac{-16 \pm 4i}{2(4)} = \frac{-16 \pm 4i}{8} = \frac{4(-4 \pm i)}{4(2)} = \frac{4 \pm i}{2} = 2 \pm \frac{1}{2}i = 2 \pm \frac{i}{2}$

WebAssign $2+\frac{i}{2}, 2-\frac{i}{2}$

$x^4-2x^2-3=0$ is quadratic in form.

Let $u=x^2$. Then

$u^2-2u-3=0 \Rightarrow$

$(u-3)(u+1)=0 \Rightarrow$

$u=x^2=3$ or $u=x^2=-1$

$\Rightarrow x=\pm\sqrt{3}$ or $x=\pm\sqrt{-1} = \pm i$

$\sqrt{3}, -\sqrt{3}, i, -i$

$x^2+49 = x^2-(-49) = (x-\sqrt{-49})(x+\sqrt{-49}) = (x-7i)(x+7i)$

$a^2-b^2 = (a-b)(a+b)$

$x^2+49=0$

$x^2=-49$

$x=\pm\sqrt{-49} = \pm 7i$

$98 \times 2 = 196$

$196 = 2 \cdot 98$, $98 = 2 \cdot 49$, $49 = 7 \cdot 7$

$a=1, b=0, c=49 \Rightarrow b^2-4ac = 0^2-4(1)(49) = -196$

$\Rightarrow \sqrt{-196} = 14i$

$x = \frac{\pm 14i}{2} = \pm 7i$

$x^3+3x^2-3x-9=0$

$x^2(x+3)-3(x+3) = (x+3)(x^2-3) = (x+3)(x-\sqrt{3})(x+\sqrt{3})$

FACTOR
BY GROUPING.

viewing 3 as $\sqrt{3}^2$

$x^2-3 = x^2-\sqrt{3}^2 =$

Rational Zeros Theorem

$a_n x^n + \dots + a_1 x + a_0$

If $\frac{p}{q}$ is a root, then p is a factor of a_0, q is a factor of a_n

$a_n = 1$, $a_0 = -9$ Possible rational zeros:

q p

$\pm\frac{9}{1}, \pm\frac{3}{1}, \pm\frac{1}{1}$

$\pm 9, \pm 3, \pm 1$ would be guesses.

$x^3+3x^2-3x-9=0$

$$\begin{array}{r|rrrr} 1 & 1 & 3 & -3 & -9 \\ & & 1 & 4 & 1 \\ \hline & 1 & 4 & 1 & -8 \end{array}$$

This says $x^3+3x^2-3x-9 = \underline{(x-1)(x^2+4x+1)} - 8$

x^3+3x^2-3x-1

$$\begin{array}{r|rrrr} -1 & 1 & 3 & -3 & -9 \\ & & -1 & -2 & 5 \\ \hline & 1 & 2 & -5 & -4 \end{array}$$

$$\begin{array}{r|rrrr} 3 & 1 & 3 & -3 & -9 \\ & & 3 & 18 & \\ \hline & 1 & 6 & 15 & \end{array}$$

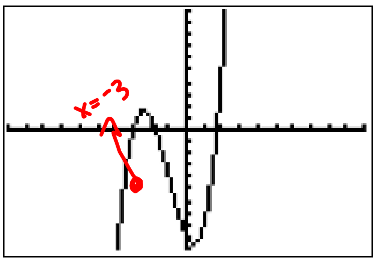
Nope

$$\begin{array}{r|rrrr} -3 & 1 & 3 & -3 & -9 \\ & & -3 & 0 & 9 \\ \hline & 1 & 0 & -3 & 0 \end{array}$$

Sweet!

This says $f(x) = (x+3)(x^2-3)$

Then get the other 2 roots by solving $x^2-3=0$



So, $\begin{array}{r|rrrr} -3 & 1 & 3 & -3 & -9 \end{array}$

etc.