Completing the Square

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

$$\sqrt{(x-2)^2} = \sqrt{0}$$

$$x = 2$$

$$x^2 - 4x + 5 = 0$$

$$x^2 - 4x + 4 = -1$$

$$\sqrt{(x-2)^2} = \sqrt{-1}$$

$$x - 2 = i$$

$$x = i + 2$$

Factor

$$x^2 - 4x + 40 = 0$$

$$x^2 - 4x + \underline{4} = -36$$

$$\sqrt{(x-2)^2} = \sqrt{-36}$$

$$x - 2 = \pm 6i$$

$$x = 2 \pm 6i$$

$$\boxed{(x-(2-6i))(x-(2+6i))}$$

Complex

- Real & imaginary components
- Complex roots always have conjugates

$x = 2 \; ; \; -5$

$(x-2)(x+5) = 0$

Factor

$$4x^2 - 20x + 79$$

$$x = \frac{5 \pm 3i\sqrt{6}}{2}$$

Given that $\frac{(1 - i\sqrt{6})}{1}$ is a root of $f(x) = x^3 + x^2 + x + 21$

find the other roots.

$(1 + i\sqrt{6})$

Non calc

$x^2 = 2$ root

$x^3 = 3$ roots

$$\left(x - (1 + i\sqrt{6})\right)\left(x - (1 - i\sqrt{6})\right)(x - k) = x^3 + x^2 + x + 21$$

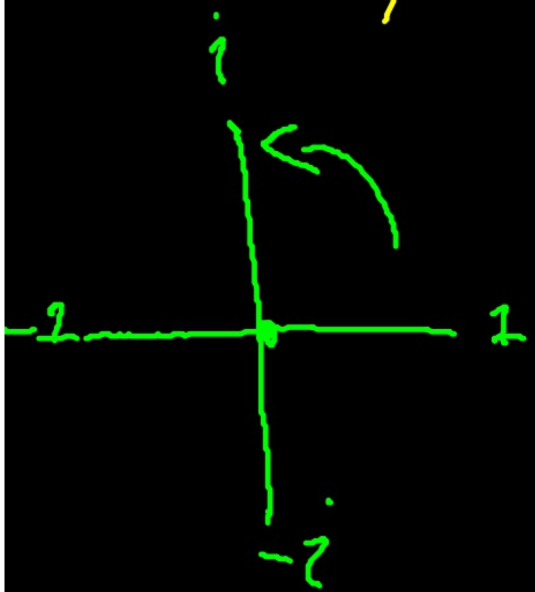
$$f(z) = z^4 + z^3 + 5z^2 + 4z + 4$$

$$16 - 8i - 20 + 8i + 4$$

a) Show that $f(2i) = 0$

b) Hence, find the other solutions: $-2i$, -1

c) Write $f(z)$ as a product of 2 real quadratics



$$(2i)^4 = 16i^4 = 16i^2 \cdot i^2 = 16 i \cdot i \cdot i \cdot i =$$

$$16\sqrt{-1}\cdot\sqrt{-1}\cdot\sqrt{-1}\cdot\sqrt{-1}$$

$$-1 \cdot -1$$

$$1$$

$$(z-2i)(z+2i)(z-k)(z-m)$$

$$-4i^2 \qquad (z+1)(z+1)$$

$$(z^2+4) \cdot (z+1)^2$$