$z = -2 + 2\sqrt{3}i$

a) Find $|z|$ and $\arg(z)$

b) Find z^6 and simplify your answer

c) Given that $w^4 = z^3$, find the values of w in the form $a + ib$

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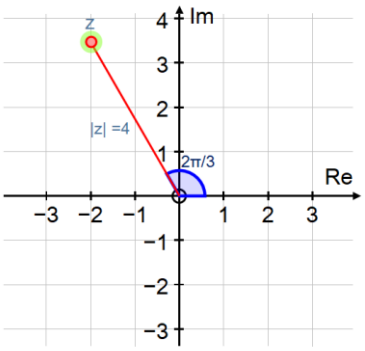
a) $z = -2 + 2\sqrt{3}i$



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

$$|z| = \sqrt{4 + 12} = \sqrt{16}$$

$$|z| = 4$$

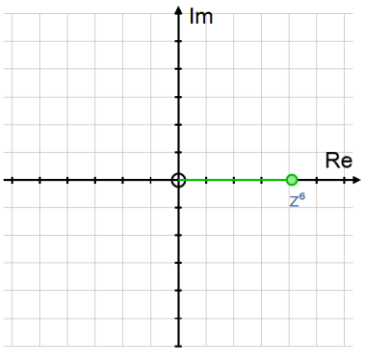
$$arctan\left(\frac{2\sqrt{3}}{-2}\right) = -\frac{\pi}{3}$$

$$\arg(z) = \frac{2\pi}{3}$$

b) $z = 4cis\left(\frac{2\pi}{3}\right)$

$$z^6 = 4^6 cis\left(6 \cdot \frac{2\pi}{3}\right)$$

$z^6 = 4096cis4\pi$



$z^6 = 4096$

c) $w^4 = z^3 = 4^3 cis\left(3 \cdot \frac{2\pi}{3}\right)$

$w^4 = 64cis2\pi$

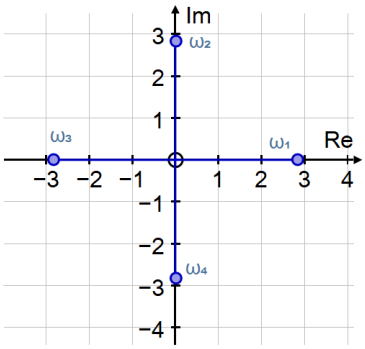
$w^4 = 64$

$w^4 = 64cis(0 + 2k\pi)$ $\quad k = 0,1,2,3$

$w = 64^{\frac{1}{4}} cis\left(\frac{2k\pi}{4}\right)$ $\quad k = 0,1,2,3$

$w = \sqrt{8}cis\left(\frac{k\pi}{2}\right)$ $\quad k = 0,1,2,3$

Using symmetry



$w = \sqrt{8}\,,\ \sqrt{8}i\,,\ -\sqrt{8}\,,\ -\sqrt{8}i$