NOTES: SECONDARY 2 HONORS

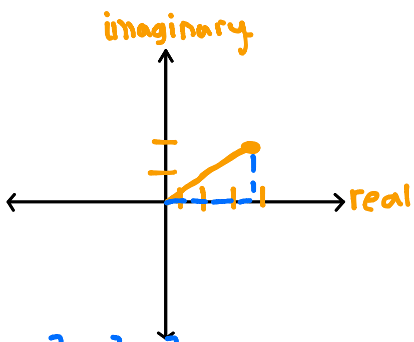
GRAPHING COMPLEX AND DIVIDING COMPLEX NUMBERS (5.2BH/5.2CH)

VOCABULARY:

- **Modulus**: represents the distance a complex number is from the origin.
- The modulus of the complex number $a+bi$ is symbolized as $|a+bi|$

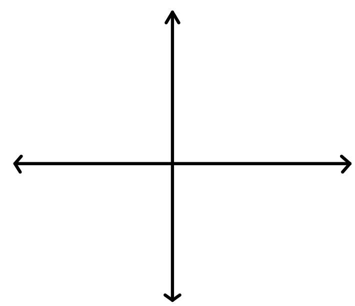
Example: Graph the following complex numbers on the complex plane and then find the modulus.

1. $4+2i$

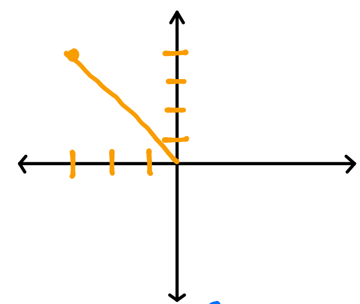


$a^2+b^2=c^2$
$4^2+2^2=c^2$
$16+4=c^2$
$20=c^2$
$c=2\sqrt{5}$
$\boxed{|4+2i|=2\sqrt{5}}$

2. $2-i$



3. $-3+4i$



$(3)^2+(4)^2=c^2$
$9+16=c^2$
$25=c^2$
$c=5$
$\boxed{|-3+4i|=5}$

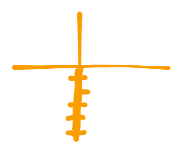
From the example above, we see that $|a+bi| = \sqrt{a^2+b^2}$

Example: Find the modulus of the following examples.

1. $|3-2i| = \sqrt{3^2+(-2)^2}$
$=\sqrt{9+4}$
$=\boxed{\sqrt{13}}$

2. $|-6+4i|$

3. $|-5i| = \sqrt{0^2+(-5)^2}$
$=\sqrt{0+25}=\sqrt{25}$
$=\boxed{5}$



DIVIDING COMPLEX NUMBERS

We cannot have an imaginary number in the denominator. So we need to multiply the denominator by the conjugate to get a real number. But remember, whatever you multiply the bottom by, you need to multiply the top as well.

Example: Divide each complex rational expression and write the answer in standard form.

1. $\frac{2}{8i}\cdot\frac{-8i}{-8i}=\frac{-16i}{-64i^2}=\frac{-16i}{64}$
$=\boxed{\frac{-i}{4}}$

2. $\frac{6+8i}{9i}$

3. $\frac{10}{(2+i)}\cdot\frac{2-i}{(2-i)}=\frac{20-10i}{4\cancel{-2i+2i}-i^2}$
$=\frac{20-10i}{4+1}=\frac{20-10i}{5}$
$=\boxed{4-2i}$

4. $\frac{(22-7i)}{4-5i}\cdot\frac{(4+5i)}{4+5i}=$
$=\frac{88+110i-28i-35i^2}{(4)^2-(5i)^2}$
$=\frac{88+82i+35}{16+25}=\frac{123+82i}{41}$
$=\boxed{3+2i}$

5. $\frac{6+2i}{1-2i}\cdot\frac{1+2i}{1+2i}=\frac{6+12i+2i+4i^2}{1-4i^2}$
$=\frac{6+14i-4}{1+4}=\boxed{\frac{2+14i}{5}}$