

Complex Numbers Review Packet

Name:

TOPIC 1

Simplifying negative radicals using imaginary numbers

$$\sqrt{-1} = i$$

i is called the complex unit

Example:

$$\sqrt{-75}$$

$$\sqrt{25} \times \sqrt{-1} \times \sqrt{3}$$

$$5i\sqrt{3}$$

On your own:

1. $\sqrt{-36}$

2. $\sqrt{-50} - \sqrt{-2} + \sqrt{-200}$

3. $2\sqrt{-75}$

TOPIC 2

Simplifying powers of i

$$i^0 = 1$$

$$i^1 = i$$

$$i^2 = -1$$

$$i^3 = -i$$

Example:

Evaluate i^{21}

$$21/4 = 5.25$$

$$i^{21} = i^{16} = i$$

On your own:

1. i^{22}

2. i^{100}

TOPIC 3

Adding and subtracting complex numbers

Adding and subtracting complex numbers is similar to adding and subtracting algebraic expressions. Simply combine your "like" terms by adding or subtracting. Your answer should be in $a+bi$ form

Example:

$$(4+3i)+(2+5i)$$

$$8i+6$$

On your own:

1. $(8-i)+(3-7i)=$

2. $(7+4i)-(-1+3i)=$

TOPIC 4

How to multiply complex numbers

We can multiply complex numbers the same way we would multiply binomials. Just keep in simplest $a+bi$ form

Example:

$$(5+2i)(3+4i)$$

$$15+20i+6i+8i^2$$

$$15+26i+8(-1)$$

$$15-8+26i$$

$$7+26i$$

On your own:

1. $(2+6i)^2$

2. $(9+3i)(9-3i)$

Topic 5

How to graph complex numbers

1. $3+4i$ $(3,4)$

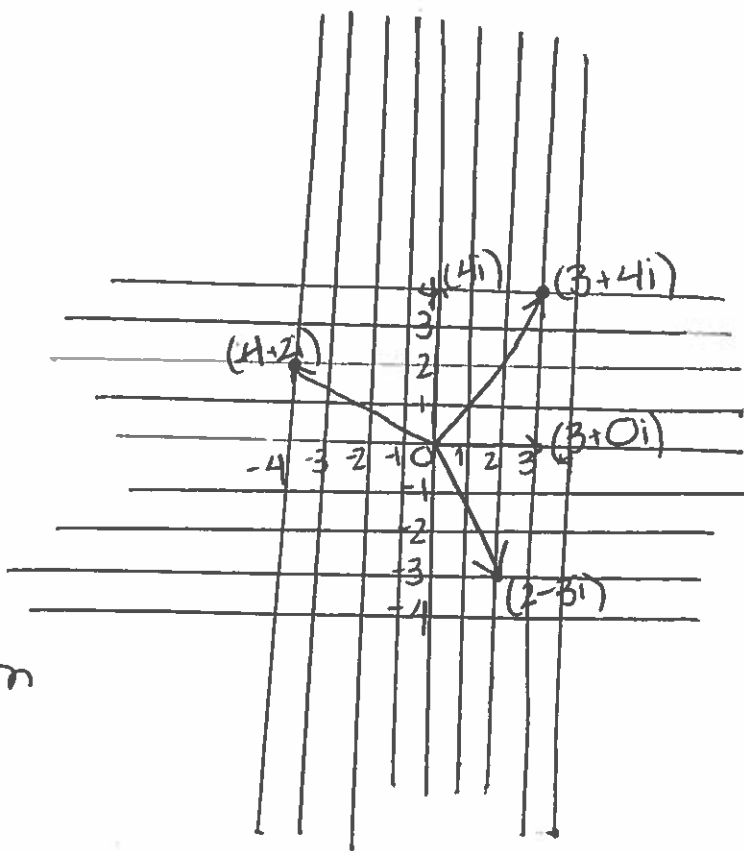
2. $2-3i$ $(2,-3)$

3. $-4+2i$ $(-4,2)$

4. 3 $(3+0i)$ $(3,0)$

5. $4i$ $(0+4i)$ $(0,4)$

the complex # is represented by the point, or by the vector from the origin to the point



TOPIC 6

Solve quadratic equations using the quadratic formula

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

Example:

$$x^2 - 4x + 29 = 0$$

$$x = \frac{+4 \pm \sqrt{(-4)^2 - 4(1)(29)}}{2(1)}$$

$$x = 2 \pm 5i$$

On your own:

1. $6m^2 + 7m + 8 = 0$

TOPIC 7

Identify complex conjugates

Complex conjugates are two complex numbers that have the form $a+bi$ and $a-bi$

Examples:

Show that the product of $a+bi$ and $a-bi$ is the purely real number a^2+b^2

$$\begin{aligned} (a+bi)(a-bi) \\ a^2 + a\cancel{bi} - \cancel{abi} - b^2i^2 \\ a^2 - b^2(-1) \\ a^2 + b^2 \end{aligned}$$

On your own:

1. Perform the following complex calculation. Express your answer in simplest form.

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

TOPIC 8

Solving for missing variables in a complex number equation

Two complex numbers $a+bi$ and $c+di$ are equal if only if $a=c$ and $b=d$

Examples:

$$5x+3yi=20+9i$$

$$\frac{5x}{5} = \frac{20}{5} \quad \frac{3y}{3} = \frac{9}{3}$$

$$x = 4$$

$$y = 3$$

TOPIC 9

Solving higher degree polynomial equations

Examples: Find the roots of $f(x) = x^3 - 3x^2 - 4x + 12$

$$(x^3 - 3x^2)(-4x + 12)$$

$$x^2(x-3) - 4(x-3)$$

$$(x^2 - 4)(x-3)$$

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

$$x = \pm 2, 3$$

complex numbers Review packet ANSWER KEY:

Topic 1

1) $6i$

2) $14i\sqrt{2}$

3) $10i\sqrt{3}$

Topic 2

1) $-1 = i^2$

2) $1 = i^0$

Topic 3

1) $11 - 8i$

2) $8 + i$

Topic 4

1) $24i - 32$

2) $90 + 0i$

Topic 6

1) $\left(\frac{-7 + i\sqrt{143}}{12}, \frac{-7 - i\sqrt{143}}{12} \right)$

Topic 7

1) 400