Lesson 3: Arithmetic with Complex Numbers

Practice Multiplying complex numbers.

Do Now: Find the product of (3+i) and(2+i).

$(3+i)(2+i)$

$6+3i+2i+i^2$

$\boxed{5+5i}$

Find the product of (-3+2i) and (5+3i).

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

$-15-9i+10i+6i^2$

$-15+i-6$

$\boxed{-21+i}$

Find of the sum of $2+3i$ and $-5-7i$.

$(2+3i)+(-5-7i)$

$2+3i-5-7i$

$\boxed{-3-4i}$

Practice:

Simplify.

1) $i+6i$

$7i$

2) $3+4+6i$

$7+6i$

3) $3i+i$

$4i$

4) $-8i-7i$

$-15i$

5) $-1-8i-4-i$

$-5-9i$

6) $7+i+4+4$

$15+i$

7) $-3+6i-(-5-3i)-8i$

$2+i$

8) $3+3i+8-2i-7$

$4+i$

9) $4i(-2-8i)$

$32-8i$

10) $5i\cdot -i$

5

13) $(-2-i)(4+i)$

$-7-6i$

14) $(7-6i)(-8+3i)$

$-38+69i$

15) $7i\cdot 3i(-8-6i)$

$168+126i$

16) $(4-5i)(4-i)$

$21-16i$

17. $(x+3i)(x-3i)$

x^2+9

18. $(x+3i)(x-i)(x+i)(x-3i)$

$(x^2+9)(x^2+1)$

x^4+10x^2+9

19. $(x+i)^2\cdot(x-i)^2$

$(x+i)(x-i)(x+i)(x-i)$

$(x^2+1)(x^2+1)$

x^4+2x^2+1

Patterns in complex numbers:

Remember, $i = \sqrt{-1}$ So... $i^0 =$ 1

$i^2 =$ -1 $i^3 =$ -i $i^4 =$ 1 $i^5 =$ i

What is i^{18}? -1

What is i^{23}? -i

What is i^{17}? i

What is i^{41}? i

Find the power of i.

23) i^{16}

A) 1 B) -i C) -1 D) i

24) i^{19}

A) -i B) -1 C) i D) 1

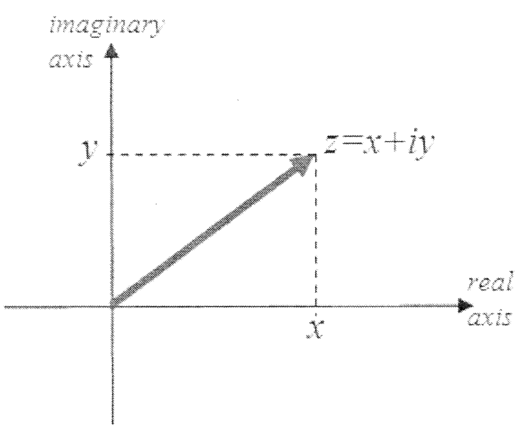
25) i^{21}

A) i B) -1 C) 1 D) -i

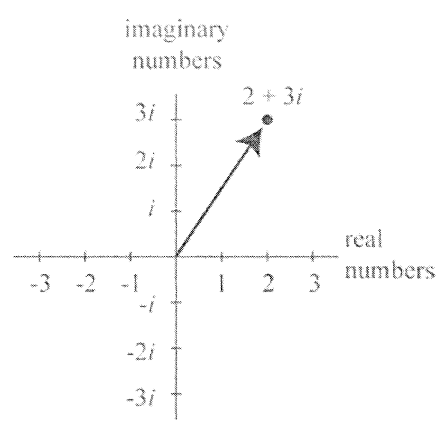
26) i^{14}

A) i B) -1 C) 1 D) -i

Graphing Complex Numbers

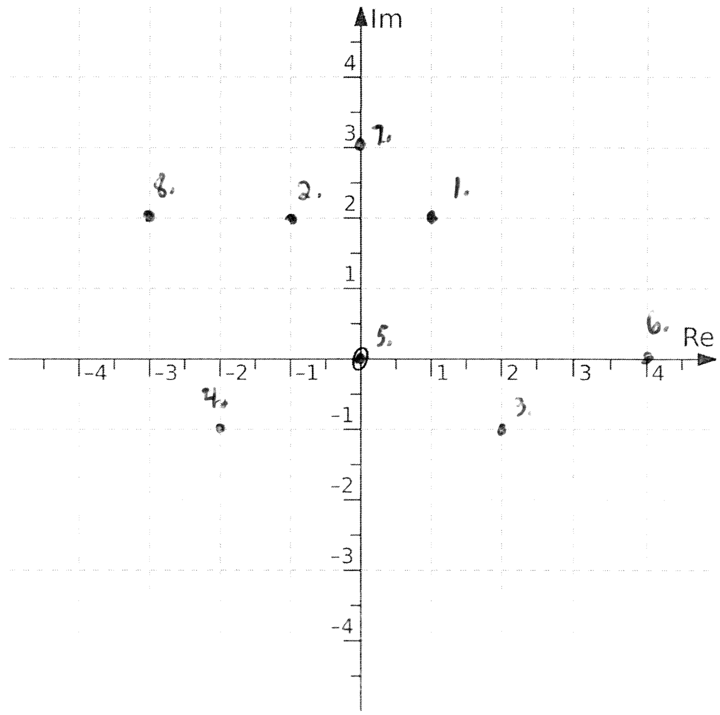


Graph the number 2+3i



Graph the following numbers on the axis at the right. Label them after you graph them. You do not need to draw an arrow to the point.

1. $1 + 2i$
2. $-1 + 2i$
3. $2 - i$
4. $-2 - i$
5. 0
6. 4
7. $3i$
8. $-3 + 2i$

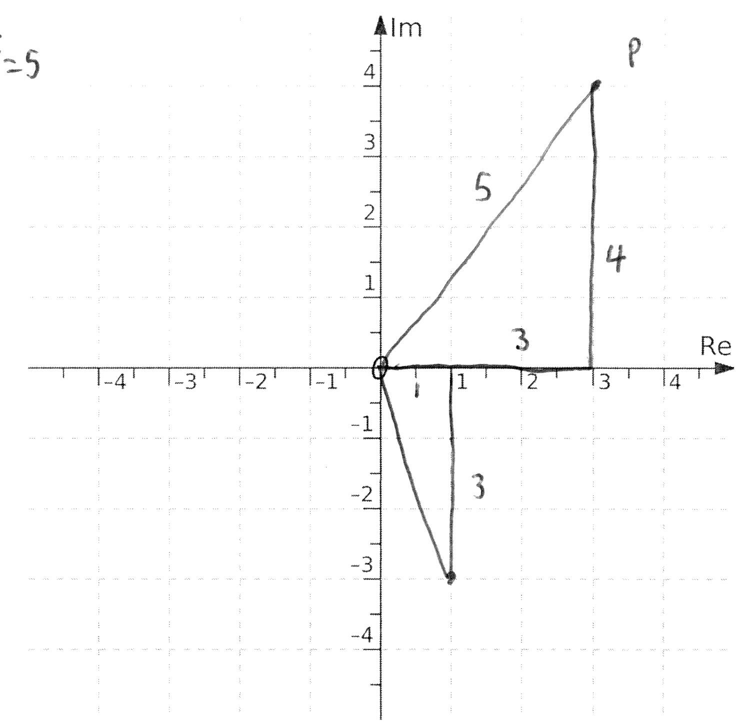


MODULUS

Graph the point $3 + 4i$. Label that point P. Draw a line from O to P. Turn this into a triangle with base along the REAL AXIS. The distance OP is called the ___modulus___ of $3 + 4i$.

Find the modulus OR $|3 + 4i|$.

$$\sqrt{3^2+4^2} = \sqrt{9+16} = \sqrt{25} = 5$$



Follow the same steps with the number $1 - 3i$.

Find $|1 - 3i|$.

$$1^2 + 3^2 = c^2$$

$$\sqrt{1+9} = c$$

$$\boxed{\sqrt{10} = c}$$

Find the absolute value of each complex number.

1) $|7 - i|$

$5\sqrt{2}$

2) $|-5 - 5i|$

$5\sqrt{2}$

3) $|-2 + 4i|$

$2\sqrt{5}$

4) $|3 - 6i|$

$3\sqrt{5}$

5) $|10 - 2i|$

$2\sqrt{26}$

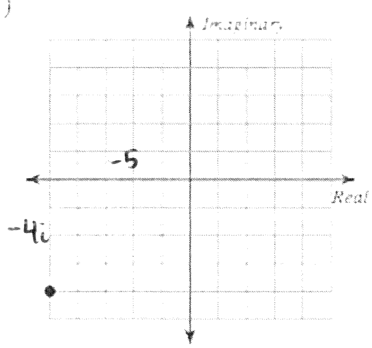
6) $|-4 - 8i|$

$4\sqrt{5}$

HOMEWORK

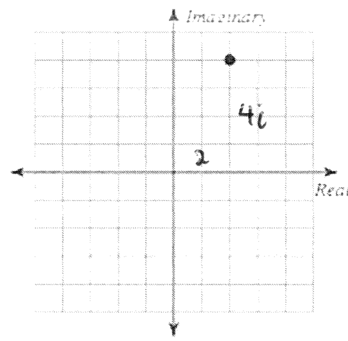
Identify each complex number graphed.

17)



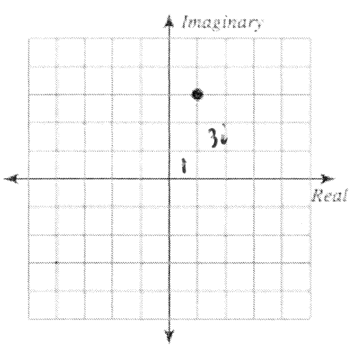
$-5-4i$

18)



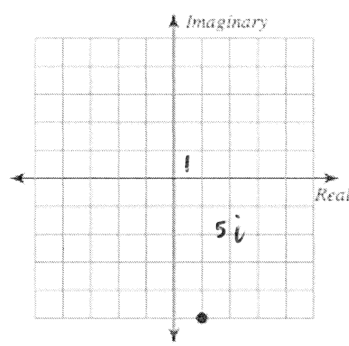
$2+4i$

19)



$1+3i$

20)

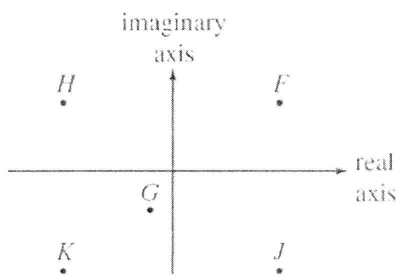


$1-5i$

Which point has the smallest modulus?

48. In a complex plane, the vertical axis is the *imaginary axis* and the horizontal axis is the *real axis*. Within the complex plane, a complex number $a + bi$ is comparable to the point (a, b) in the standard (x, y) coordinate plane. $\sqrt{a^2 + b^2}$ is the modulus of the complex point $a + bi$. Which of the complex numbers F, G, H, J, and K below has the smallest modulus?

↳ distance from origin



F. *F*
G. *G*
H. *H*
J. *J*
K. *K*

Subtract a from b, given:

$a = 3 + i$

$b = 4 - 2i$

Possible Answers:

$-1 + 3i$

$1 - 3i$

$3 + i$

$1 + 3i$

$-1 - 3i$

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

$4-2i-3-i$

$1-3i$

Complex numbers take the form $a + bi$, where a is the real term in the complex number and bi is the nonreal (imaginary) term in the complex number.

Which of the following equations simplifies into $4 + 2i$?

Possible Answers:

$(8 - 5i) + (-4 + 7i) = 4 + 2i$

$(10 - i) - (6 - i) = 4 + 0i$

$(0 + 7i) - (-4 - 5i) = 4 + 12i$

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

$0 + 6i + (-4 - 4i) = -4 + 2i$