Quiz 7.7

1 (3 points) Solve the equation.

$$\sqrt{p} = 2p$$

2. (2 points) Solve the equation.

$$\sqrt{2x-1} + 5 = 8$$

Mar 10-9:46 AM

Oct 30-12:08 PM

7.8 The Complex Number System

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

or

$$i^2 = -1$$

Mar 10-9:48 AM

Definition

Complex numbers are numbers of the form $a+bi$, where a and b are real numbers. The real number $a$ is called the real part and the number $b$ is called the imaginary part.

$a + bi$

$a - bi$

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Write each of the following as a pure imaginary number.

$\sqrt{-16}$ $\sqrt{-3}$ $\sqrt{-18}$

$\sqrt{-1}\cdot\sqrt{16}$ $\sqrt{-1}\cdot\sqrt{3}$

$i4$ $\sqrt{3}\,i$

$\pm 4i$ $i\sqrt{3}$

$a+bi$

Mar 10-9:54 AM

You Try

$\sqrt{-12}$ $\sqrt{-5}$ $\sqrt{-36}$

$2\sqrt{3}\,i$

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Write each in Standard Form $(a+bi)$

$2-\sqrt{-25}$ $3+\sqrt{-50}$ $\dfrac{4-\sqrt{-12}}{2}$

$2-5i$ $2-\sqrt{3}\,i$ $=\dfrac{4-2\sqrt{3}\,i}{2}$

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You Try

$-2-\sqrt{-8}$ $\dfrac{6-\sqrt{-72}}{3}$

$\sqrt{-1}\cdot\sqrt{9}\cdot\sqrt{8}$ $=\dfrac{6-6\sqrt{2}\,i}{3}$

$=2-2\sqrt{2}\,i$

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Add:

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

$2+2i$

$\left(4+\sqrt{-25}\right)+\left(-6-\sqrt{-16}\right)$

$(4+5i)+(-6-4i)$

$-2+i$

Mar 10-10:00 AM

Subtract: $7i--4i$

$(-3+7i)-(5-4i)$

$-8+11i$

$\left(3+\sqrt{-12}\right)-\left(-2-\sqrt{-27}\right)$

$(3+2\sqrt{3}i)-(-2-3\sqrt{3}i)$

$5+5\sqrt{3}i$

Mar 10-10:01 AM

You Try

$\left(4-\sqrt{-4}\right)+\left(-7+\sqrt{-9}\right)$

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

Mar 10-10:03 AM

Multiply

$4i(3-6i)$ $24+12i$

$12i-24i^2$

$12i-24(-1)$

$12i+24$

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

$-6+2i+12i-4i^2$ $-4(-1)=4$

$-2+14i$

Mar 10-10:04 AM

Remember from before:

$$\sqrt[n]{a}\sqrt[n]{b} = \sqrt[n]{ab}$$

only works when $\sqrt[n]{a}$ and $\sqrt[n]{b}$ are real numbers

This means that

$$\sqrt{a}\sqrt{b} \neq \sqrt{ab} \text{ if } a<0 \text{ or } b<0$$

Mar 10-10:06 AM

Multiply

$\sqrt{25}\sqrt{4} = \sqrt{100} = 10$

$\sqrt{-25}\sqrt{-4} \neq \sqrt{100} = 10$

$(5i)(2i) = 10i^2 = -10$

$$\left(2+\sqrt{-16}\right)\left(1-\sqrt{-4}\right)$$

$4i$ $2i$

$2 - 4i + 4i - 8i^2$

10

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You Try

$$\sqrt{-9}\sqrt{-36}$$

$$\left(2+\sqrt{-36}\right)\left(4-\sqrt{-25}\right)$$

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Multiply (What Happens?)

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

$16 - 12i + 12i - 9i^2$

25

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Complex Conjugate

If $a+bi$ is a complex number, then its conjugate is defined as $a-bi$

$-2+3i$

$-2-3i$

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Divide:

$\frac{3+4i}{2i} \cdot \frac{-2i}{-2i} = \frac{-6i-8i^2}{-4i^2}$

$= \frac{8-6i}{4} = 2-\frac{3}{2}i$

$\frac{(-3+i)(5-3i)}{(5+3i)(5-3i)} = \frac{-15+9i+5i-3i^2}{25-9i^2}$

$= \frac{-12+14i}{34} = -\frac{6}{17}+\frac{7}{17}i$

Mar 10-10:20 AM

You Try

$$\frac{-4+i}{3i}$$

$$\frac{4+3i}{1-3i}$$

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Evaluate

$i^1 = i$

$i^2 = -1$

$i^3 = i^2 \cdot i = -1 \cdot i = -i$

$i^4 = i^2 \cdot i^2 = -1 \cdot -1 = 1$

$i^5 = i^4 \cdot i = 1 \cdot i = i$

$i^6 = i^2 \cdot i^2 \cdot i^2 = -1$

$i^7 = -i$

$i^8 = 1$

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Evaluate:

$i^{34}$

$\frac{34}{4} = 8 \text{ R } 2$

$(i^4)^8 \cdot i^2$

$1 \cdot -1 = -1$

$i^{101}$

$\frac{101}{4} = 25 \text{ R } 1$

$(i^4)^{25} \cdot i$

$1 \cdot i = i$

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You Try

$i^{43}$

$i^{98}$

Mar 10-10:26 AM

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