

Math 98 Worksheet #4 Solutions

1. Simplify the following.

$$(a) (1 - 3i) + (-3 + i) = -2 - 2i$$

$$(b) 12i(3 - 4i) = 36i - 48i^2 = 36i - 48(-1) = 36i + 48$$

$$(c) \sqrt{-6} \cdot \sqrt{-24} = i\sqrt{6} \cdot i\sqrt{24} = i^2\sqrt{6 \cdot 24} = -\sqrt{144} = -12$$

$$(d) \frac{8i}{\sqrt{-32}} = \frac{8i}{i\sqrt{32}} = \frac{8i}{4i\sqrt{2}} = \frac{2}{\sqrt{2}} = \frac{2\sqrt{2}}{2} = \sqrt{2}$$

2. Solve the following equations.

$$(a) r^2 = 81$$

$$\text{Square Root Property: } r = \sqrt{81} = 9 \quad \text{OR} \quad r = -\sqrt{81} = -9$$

$$\text{Solutions: } r = \pm 9$$

$$(b) 2a^2 + 9 = 49$$

$$\text{Isolating } a^2: \quad 2a^2 = 40 \quad \Rightarrow \quad a^2 = 20$$

$$\text{Square Root Property: } a = \sqrt{20} = 2\sqrt{5} \quad \text{OR} \quad a = -\sqrt{20} = -2\sqrt{5}$$

$$\text{Solutions: } a = \pm 2\sqrt{5}$$

$$(c) k^2 + 10 = 6$$

$$\text{Isolating } k^2: \quad k^2 = -4$$

$$\text{Square Root Property: } k = \sqrt{-4} = 2i \quad \text{OR} \quad k = -\sqrt{-4} = -2i$$

$$\text{Solutions: } k = \pm 2i$$

$$(d) \left(\frac{1}{3}p + 1\right)^2 = 9$$

$$\begin{array}{l} \text{Square Root Property: } \frac{1}{3}p + 1 = \sqrt{9} = 3 \quad \text{OR} \quad \frac{1}{3}p + 1 = -\sqrt{9} = -3 \\ \frac{1}{3}p = 2 \quad \text{OR} \quad \frac{1}{3}p = -4 \\ p = 6 \quad \text{OR} \quad p = -12 \end{array}$$

$$\text{Solutions: } p = 6 \text{ or } -12$$

(e) $3(x - 13)^2 + 8 = 2$

Isolating $(x - 13)^2$: $3(x - 13)^2 = -6 \Rightarrow (x - 13)^2 = -2$

Square Root Property: $x - 13 = \sqrt{-2} = i\sqrt{2}$ OR $x - 13 = -\sqrt{-2} = -i\sqrt{2}$
 $x = 13 + i\sqrt{2}$ OR $x = 13 - i\sqrt{2}$

Solutions: $x = 13 \pm i\sqrt{2}$

3. Solve the following equations.

(a) $x^2 + 10x + 13 = -5$

Note that $(x + 5)^2 = x^2 + 10x + 25$.

So, $x^2 + 10x + 13 = -5$
 $x^2 + 10x = -18$
 $x^2 + 10x + 25 = 7$ (Adding 25 to both sides.)
 $(x + 5)^2 = 7$

Square Root Property: $x + 5 = \sqrt{7}$ OR $x + 5 = -\sqrt{7}$
 $x = -5 + \sqrt{7}$ OR $x = -5 - \sqrt{7}$

Solutions: $x = -5 \pm \sqrt{7}$

(b) $m^2 - 6m = -13$

Note that $(m - 3)^2 = m^2 - 6m + 9$.

So, $m^2 - 6m = -13$
 $m^2 - 6m + 9 = -4$ (Adding 9 to both sides.)
 $(m - 3)^2 = -4$

Square Root Property: $m - 3 = \sqrt{-4} = 2i$ OR $m - 3 = -\sqrt{-4} = -2i$
 $m = 3 + 2i$ OR $m = 3 - 2i$

Solutions: $m = 3 \pm 2i$