

$$48/48 = 100$$

Math 0099
University of North Georgia
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Exam #3

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Simplify and write in $a + bi$ form.

$$1. \sqrt{-63} = i\sqrt{9 \cdot 7} = 3i\sqrt{7} \quad \boxed{0 + 3i\sqrt{7}}$$

$$2. \frac{\sqrt{-40}}{\sqrt{-8}} = \frac{2i\sqrt{10}}{2i\sqrt{2}} = \sqrt{5} = 0i \quad \boxed{\sqrt{5} = 0i}$$

$$3. \frac{6+2i}{4-3i} = \frac{6+2i}{4-3i} \cdot \frac{4+3i}{4+3i} = \frac{24+18i+8i-6}{16+9}$$

$$4. i^{-23} = \frac{1}{i^{23}} = \frac{1}{(i^4)^5 \cdot i^3 \cdot i} = \frac{1}{-i \cdot i} = \frac{i}{-i^2} = \frac{18 + \frac{26}{25}i}{25} \quad \boxed{0 + i}$$

Use the Square Root Property to solve.

$$5. x^2 + 11 = 0$$
$$x^2 = -11$$
$$\boxed{x = \pm i\sqrt{11}}$$

$$6. \left(x - \frac{2}{3}\right)^2 = 5$$
$$x - \frac{2}{3} = \pm \sqrt{5}$$
$$\boxed{x = \frac{2}{3} \pm \sqrt{5} \quad \text{or} \quad \frac{2 \pm 3\sqrt{5}}{3}}$$

Use *Completing the Square* to solve.

7. $x^2 + x - 1 = 0$

$$x^2 + x = 1$$

a.) $1 \cdot \frac{1}{2} = \frac{1}{2}$

b.) $(\frac{1}{2})^2 = \frac{1}{4}$

$$x^2 + x + \frac{1}{4} = 1 + \frac{1}{4} = \frac{4+1}{4} = \frac{5}{4}$$

$$(x + \frac{1}{2})^2 = \frac{5}{4}$$

$$x + \frac{1}{2} = \pm \frac{\sqrt{5}}{2}$$

$$x = \frac{-1 \pm \sqrt{5}}{2}$$

8. $3x^2 - 4x = 4$

$$x^2 - \frac{4}{3}x = \frac{4}{3}$$

a.) $-\frac{4}{3} \cdot \frac{1}{2} = -\frac{4}{6} = -\frac{2}{3}$

b.) $(-\frac{2}{3})^2 = \frac{4}{9}$

$$x^2 - \frac{4}{3}x + \frac{4}{9} = \frac{4}{3} + \frac{4}{9} = \frac{12+4}{9} = \frac{16}{9}$$

$$(x - \frac{2}{3})^2 = \frac{16}{9}$$

$$x - \frac{2}{3} = \pm \frac{4}{3}$$

$$x = \frac{2 \pm 4}{3}$$

$$\begin{array}{l} \textcircled{1} x = 2 \\ \textcircled{2} x = -\frac{2}{3} \end{array}$$

Use the *Quadratic Formula* to solve.

9. $x^2 + 4x + 6 = 0$ $a = 1, b = 4, c = 6$ $b^2 - 4ac = (4)^2 - 4(1)(6)$

$$x = \frac{-(-4) \pm \sqrt{-8}}{2(1)}$$

$$= 16 - 24$$

$$= -8$$

2 Complex

$$= \frac{-4 \pm 2i\sqrt{2}}{2}$$

$$= -\frac{4}{2} \pm \frac{2i\sqrt{2}}{2}$$

$$x = -2 \pm i\sqrt{2}$$

Find the *Discriminant* and determine the number and types of solutions to the below equation.

10. $5y^2 - 15y = 1$

$$5y^2 - 15y - 1 = 0 \quad a = 5, \quad b = -15, \quad c = -1$$

$$\begin{aligned} b^2 - 4ac &= (-15)^2 - 4(5)(-1) \\ &= 225 - (20)(-1) \\ &= 225 + 20 \\ &= \boxed{245} \end{aligned}$$

Two Real Solutions

Solve by any method.

11. $x - \sqrt{x} - 6 = 0$

$$x - 6 = \sqrt{x}$$

$$x^2 - 12x + 36 = x$$

$$x^2 - 13x + 36 = 0$$

$$\begin{aligned} b^2 - 4ac &= (-13)^2 - 4(1)(36) \\ &= 169 - 144 \\ &= 25 \end{aligned}$$

$$\begin{aligned} 9 - \sqrt{9} - 6 &= 0 \\ 9 - 3 - 6 &= 0 \\ 6 - 6 &= 0 \\ 0 &= 0 \checkmark \end{aligned}$$

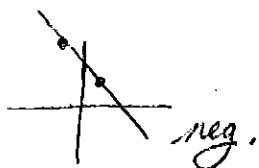
$$\begin{aligned} 4 - \sqrt{4} - 6 &= 0 \\ 4 - 2 - 6 &= 0 \\ 2 - 6 &= 0 \\ -4 &\neq 0 \end{aligned}$$

$$(x - 9)(x - 4) = 0$$

$$\boxed{x = 9} \quad \cancel{x = 4}$$

Find the equation in *Standard* form given the ordered pairs.

12. $(-1, 11)$ and $(2, 5)$ $m = \frac{5 - 11}{2 - (-1)} = \frac{-6}{3} = -2$



$$5 = 2(-2) + b$$

$$5 = -4 + b$$

$$9 = b$$

$$y = -2x + 9$$

$$\boxed{2x + y = 9}$$