

## QUIZ #1 @ 85 points

Write neatly. Show all work. **Write all responses on separate paper. Clearly label the exercises.**

1) Solve the following equation by the square root property. Give exact answers.

$$(3x-2)^2 = 40$$

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2) Solve the following equations by the quadratic formula. Give exact answers.

a)  $5 - \frac{2}{x} + \frac{1}{x^2} = 0$

b)  $2x^2 - 3x + 1 = 0$

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3) Solve the following equations:

a)  $\frac{x+1}{2x} = \frac{3x-1}{5}$

b)  $x(x+6) = 9$

c)  $\sqrt{x+2} + 1 = \sqrt{2x+6}$

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4) Solve the following inequality:

$$(x-1)(5-x)(x+2)^2 \leq 0$$

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5) Factor the following expressions completely:

a)  $4x^2 - 25$

b)  $t^3 - 1$

c)  $27 + y^3$

## SOLUTIONS

①  $(3x-2)^2 = 40 \quad \sqrt{\quad}$

$$\sqrt{(3x-2)^2} = \sqrt{40}$$

$$3x-2 = \pm\sqrt{40}$$

$$3x = 2 \pm 2\sqrt{10}$$

$$x = \frac{2 \pm 2\sqrt{10}}{3}$$

② (a)  $5 - \frac{2}{x} + \frac{1}{x^2} = 0 \quad \times x^2$

$$LCD = x^2$$

$$\text{Condition: } x \neq 0$$

$$5x^2 - 2x + 1 = 0$$

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

$$\begin{cases} a=5 \\ b=-2 \\ c=1 \end{cases}$$

$$x = \frac{2 \pm \sqrt{4 - 4(5)(1)}}{2(5)} = \frac{2 \pm \sqrt{4-20}}{10}$$

$$x = \frac{2 \pm \sqrt{-16}}{10} = \frac{2 \pm 4i}{10}$$

$$x = \frac{2(1 \pm 2i)}{10} = \frac{1 \pm 2i}{5}$$

$$x = \frac{1 \pm 2i}{5}$$

(b)  $2x^2 - 3x + 1 = 0$

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

$$\begin{cases} a=2 \\ b=-3 \\ c=1 \end{cases}$$

$$x = \frac{3 \pm \sqrt{9 - 4(2)(1)}}{2(2)} = \frac{3 \pm 1}{4}$$

$$x = 1 \text{ OR } x = \frac{1}{2} \quad \left[ x \in \left\{ 1, \frac{1}{2} \right\} \right]$$

③ (a)  $\frac{x+1}{2x} = \frac{3x-1}{5}$

$$\text{Condition: } x \neq 0$$

$$5(x+1) = 2x(3x-1)$$

$$5x+5 = 6x^2 - 2x$$

$$6x^2 - 2x - 5x - 5 = 0$$

$$6x^2 - 7x - 5 = 0$$

$$x = \frac{7 \pm \sqrt{49 - 4(6)(-5)}}{2(6)}$$

$$= \frac{7 \pm \sqrt{49 + 120}}{12} = \frac{7 \pm \sqrt{169}}{12}$$

$$= \frac{7 \pm 13}{12} \quad \left\{ \begin{array}{l} \frac{7+13}{12} = \frac{20}{12} = \frac{5}{3} \\ \frac{7-13}{12} = \frac{-6}{12} = -\frac{1}{2} \end{array} \right.$$

$$x \in \left\{ \frac{5}{3}, -\frac{1}{2} \right\}$$

(b)  $x(x+6) = 9$

$$x^2 + 6x - 9 = 0$$

$$\begin{cases} a=1 \\ b=6 \\ c=-9 \end{cases}$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{36 - 4(1)(-9)}}{2}$$

$$= \frac{6 \pm \sqrt{72}}{2} = \frac{6 \pm 6\sqrt{2}}{2} = 3 \pm 3\sqrt{2} \quad \left[ x = 3 \pm 3\sqrt{2} \right]$$

(c)  $\sqrt{x+2} + 1 = \sqrt{2x+6} \quad \left| \right.$

$$(\sqrt{x+2} + 1)^2 = (\sqrt{2x+6})^2$$

$$x+2 + 2\sqrt{x+2} + 1 = 2x+6$$

$$x+3 + 2\sqrt{x+2} = 2x+6$$

$$2\sqrt{x+2} = 2x+6 - x - 3$$

$$2\sqrt{x+2} = x+3$$

$$2\sqrt{x+2} = x+3 \quad |^2 \quad -2-$$

$$(2\sqrt{x+2})^2 = (x+3)^2$$

$$4(x+2) = (x+3)^2$$

$$4x+8 = x^2+6x+9$$

$$x^2+6x+9-4x-8=0$$

$$x^2+2x+1=0$$

$$(x+1)^2=0$$

$$x=-1$$

$$\text{check: } \sqrt{-1+2} + 1 = \sqrt{2(-1)+6}$$

$$1+1 = \sqrt{4} \quad \text{true}$$

$$\boxed{x \in \{-1\}}$$

$$(4) (x-1)(5-x)(x+2)^2 \leq 0$$

x	$-\infty$	-2	1	5	$\infty$
x-1	-	-	0+	+	+
5-x	+	+	+	0-	-
(x+2) <sup>2</sup>	+	+	0+	+	+
(x-1)(5-x)(x+2) <sup>2</sup>	-	0-	0+	0-	-

$$x \in (-\infty, 1] \cup [5, \infty)$$

$$(5) (a) 4x^2 - 25 =$$

$$= (2x)^2 - 5^2$$

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

$$(b) t^3 - 1 = t^3 - 1^3$$

$$= (t-1)(t^2+t+1)$$

$$(c) 27 + y^3 = 3^3 + y^3$$

$$= (3+y)(3^2 - 3y + y^2)$$

$$= (3+y)(9 - 3y + y^2)$$