Algebra II/Precalculus Honors Name _____
Summer Study

Greetings,

This packet is designed to review key Algebra I concepts and help prepare you for our first assessment of the year. Please complete it as follows:

- Read the informational sections carefully.
- Complete the practice problems, showing all work and **without using a calculator**. Check your answers using the provided answer key.
- Take the Quick Quizzes to monitor your understanding. Answers are in the key packet.
- Bring your completed packet on the first day of school in the fall. This will be your first grade.
- Use this packet to prepare for the *Foundation of Algebra* test, which will be given during our third class meeting in the fall.

## 1. Algebraic Expressions, Real Numbers, Exponential Expressions & Radicals

**Order of Operations (PEMDAS)**

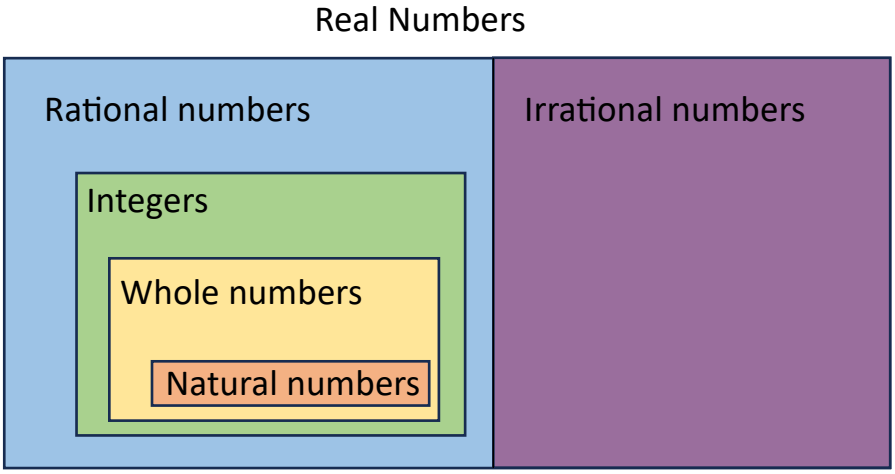
- Parentheses and other grouping symbols
- Exponential Expressions
- Multiplication and Division (left to right)
- Addition and Subtraction (left to right)

**Sets**

A set is a collection of objects whose contents, the **elements**, can be clearly determined.

- **Notation**: $\{1, 2, 3,4, \dots\}$
- **Intersection**: $A \cap B$ the set of elements common to both sets
- **Union**: $A \cup B$ the set of elements in A or B or both sets

## Real Numbers and Their Properties




- **Commutative** $a + b = b + a$
  $ab = ba$
- **Associative** $(a + b) + c = a + (b + c)$
  $(ab)c = a(bc)$
- **Distributive** $a(b + c) = ab + ac$
- **Identity** $a + 0 = a$
  $a \cdot 1 = a$
- **Inverse** $a + (-a) = 0$
  $a \cdot \frac{1}{a} = 1, a \neq 0$

**Absolute Value**

$$|x| = \begin{cases} -x, & x < 0 \\ x, & x \geq 0 \end{cases}$$

## Exponential Notation

If $b$ is a counting number (1, 2, 3, …)

$\boldsymbol{b^n = b \cdot b \cdot b \cdot \ldots \cdot b}$ the product of $n$ factors of $b$

$b$ is the **base** and $n$ is the **exponent** or **power**

## Properties of Exponents

$$b^{-n} = \frac{1}{b^n} \qquad b^0 = 1 \qquad b^m \cdot b^n = b^{m+n}$$

$$(b^m)^n = b^{mn} \qquad \frac{b^m}{b^n} = b^{m-n} \qquad (ab)^n = a^n b^n \qquad \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

## Square Roots

- If $b^2 = a$ then $b$ is a square root of $a$.
- The symbol $\sqrt{\ }$ denotes the principal (positive) square root.
- $\sqrt{a^2} = |a|$
- $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}$
- $\sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

## Rational Exponents

$a^{\frac{1}{n}} = \sqrt[n]{a} = \text{b}$ means $b^n = a$ $\qquad a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m \; OR \; \sqrt[n]{a^m}$

# Section 1 Practice

#1-4 Use order of operations to simplify each expression.

1. $10^2 - 100 \div 5^2 \cdot 2 - 3$

2. $\dfrac{(5-6)^2 - 2|3-7|}{89 - 3 \cdot 5^2}$

3. $6 - 5[8 - (2y - 4)]$

4. $14x^2 + 5 - [7(x^2 - 2) + 4]$

#5-6 Simplify each expression. Assume variables represent nonzero real numbers.

5. $\dfrac{(xy^{-2})^{-2}}{(x^{-2}y)^{-3}}$

6. $(3x^{-4}yz^{-7})(3x)^{-3}$

7. Consider the set $\left\{-17, -\frac{9}{13}, 0, 0.75, \sqrt{2}, \pi, \sqrt{81}\right\}$. List all the numbers in the set that are

a) Natural numbers _____

b) Whole numbers _____

c) Integers _____

d) Rational numbers _____

e) Irrational numbers _____

f) Real numbers _____

8. Let $A = \{a, b, c\}$ and $B = \{a, c, d, e\}$. Find the indicated set.

a) $A \cap B$

b) $A \cup B$

**Simplest radical form**:

- No integer under the radical sign with a perfect square factor
- No fractions under the radical sign
- No radicals in the denominator

9. $\sqrt{(-17)^2} =$

#10 - 12 Simplify the expression.

10. $3\sqrt{54} - 2\sqrt{24} - \sqrt{96} + 4\sqrt{63}$

11. $\frac{2}{\sqrt{10}}$

12. $\frac{11}{\sqrt{7}-\sqrt{3}}$

# 14 - 16 Simplify the expression. Assume that the variables represent positive real numbers.

14. $\sqrt{10x}\cdot\sqrt{8x^2}$

15. $\frac{\sqrt{500x^3}}{\sqrt{10x^{-1}}}$

16. $\frac{\left(2y^{\frac{1}{5}}\right)^4}{y^{\frac{3}{10}}}$

# 17 – 18 Evaluate each expression.

17. $64^{\frac{2}{3}}$

18. $27^{-\frac{4}{3}}$

# QUICK QUIZ #1

1. List all the rational numbers in this set:
   $\left\{-7, -\frac{4}{5}, 0, 0.25, \sqrt{3}, \sqrt{4}, \frac{22}{7}, \pi\right\}$ _____

#2 - 8 Simplify the given expression or perform the indicated operation. Leave answer in fully simplified form.

2. $\frac{12 \div 3 \cdot 5|2^2 + 3^2|}{7 + 3 - 6^2}$ _____

3. $7 + 2[3(x + 1) - 2(3x - 1)]$ _____

4. $\left(\frac{-30a^{14}b^8}{10a^{17}b^{-2}}\right)^3$ _____

5. $8^{-\frac{5}{3}} =$ _____

6. $3\sqrt{8} - \sqrt{32} + 3\sqrt{72} - \sqrt{75} =$ _____

7. $\sqrt{6x} \cdot \sqrt{3x^2} + \dfrac{\sqrt{24x^4}}{\sqrt{3x}} =$ _____

8. $\sqrt{13 + \sqrt{2} + \dfrac{7}{3 + \sqrt{2}}} =$ _____

## 2. Polynomials, Factoring, and Rational Expressions

**Polynomial**

A single term or sum of terms containing variables with whole number exponents.

$$a_n x^n + a_{n-1}x^{n-1} + a_{n-2}x^{n-2} + \cdots + a_1 x + a_0$$

The coefficients are real numbers.
$a_n$ is the **leading coefficient**, $a_0$ is the constant and the **degree** is $n$.

Using the **FOIL** method to multiply two binomials:

$$(3x+4)(5x-3) = \underset{\text{First}}{(3x)(5x)} + \underset{\text{Outside}}{(3x)(-3)} + \underset{\text{Inside}}{(4)(5x)} + \underset{\text{Last}}{(4)(-3)}$$

$$= 15x^2 - 9x + 20x - 12 = 15x^2 + 11x - 12$$

**Special Products**

Let A and B represent real numbers, variables, or algebraic expressions.

- $(A+B)(A-B) = A^2 - B^2$
- $(A+B)^2 = A^2 + 2AB + B^2$
- $(A-B)^2 = A^2 - 2AB + B^2$
- $(A+B)^3 = A^3 + 3A^2B + 3AB^2 + B^3$
- $(A-B)^3 = A^3 - 3A^2B + 3AB^2 - B^3$

**Factoring Methods**

- **GCF** (greatest common factor – the distributive property in reverse)

  *Example*: $18x^3 + 2x^2 = 2x^2(9x + 1)$

- **Grouping** – four terms with no factor in common to all terms

  *Example*: $x^3 + 4x^2 + 3x + 12 = x^2(x + 4) + 3(x + 4) = (x^2 + 3)(x + 4)$

- **Difference of Squares** (reverse of special product)

  *Example*: $81x^2 - 49y^2 = (9x - 7y)(9x + 7y)$

- **Perfect Square Trinomials** (reverse of special product)

  *Example*: $25x^2 - 60x + 36 = (5x - 6)^2$

- **Sum or Difference of Cubes** (SOAP)

  $A^3 + B^3 = (A + B)(A^2 - AB + B^2) \quad OR \quad A^3 - B^3 = (A - B)(A^2 + AB + B^2)$

  *Example*: $125x^3 - 8 = (5x - 2)(25x^2 + 10x + 4)$

- **Quadratic Trinomials** $ax^2 + bx + c$ (unFOIL)

  *Example*: $2x^2 + 5x - 3 = (2x - 1)(x + 3)$

- **Multiple methods** (check for GCF first ☺)

  *Example*: $2x^3 + 8x^2 + 8x = 2x(x^2 + 4x + 4) = 2x(x + 2)^2$

**Rational Expression**: the quotient of two polynomials that is defined for variable values that do not make the denominator zero.

- **Simplifying**
  1. Factor numerator and denominator completely.
  2. Divide by factors common to both.

$$Example: \frac{x^2+3x-18}{x^2-36} = \frac{(x+6)(x-3)}{(x+6)(x-6)} = \frac{x-3}{x-6}$$

- **Multiplying**

  1. Factor all numerators and denominators completely.
  2. Divide numerators and denominators by common factors.
  3. Multiply factors in numerators and factors in denominators.

$$Example: \frac{6x+2}{x^3-1} \cdot \frac{x-1}{3x+1} = \frac{2(3x+1)}{(x-1)(x^2+x+1)} \cdot \frac{x-1}{3x+1} = \frac{2}{x^2+x+1}$$

- **Dividing** – Invert the second fraction and multiply.

- **Adding or Subtracting with Different Denominators**

  1. Find the LCD of the rational expression.
  2. Rewrite each expression with the LCD by multiplying by a "well-chosen one" of missing factors/missing factors.
  3. Add or subtract the numerators, placing the resulting expression over the LCD.
  4. Simplify the resulting rational expression if possible.

$$Example: \frac{x}{x^2-9} + \frac{x-1}{x^2-5x+6} = \frac{x}{(x-3)(x+3)} + \frac{x-1}{(x-2)(x-3)} =$$

$$LCD: (x-3)(x+3)(x-2) \qquad \frac{x}{(x-3)(x+3)} \cdot \frac{x-2}{x-2} + \frac{x-1}{(x-2)(x-3)} \cdot \frac{x+3}{x+3}$$

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

- **Simplifying a Complex Fraction**

1. Find the LCD of all the fractions within the numerator and denominator.
2. Multiply by a "well-chosen one" of this LCD/LCD.

$$Example: \frac{\frac{1}{x}-\frac{1}{2}}{\frac{1}{3}-\frac{x}{6}} \quad LCD\ is\ 6x. \quad \frac{\frac{1}{x}-\frac{1}{2}}{\frac{1}{3}-\frac{x}{6}} \cdot \frac{6x}{6x} = \frac{\frac{6x}{x}-\frac{6x}{2}}{\frac{6x}{3}-\frac{6x^2}{6}} = \frac{6-3x}{2x-x^2}$$

## Section 2 Practice

#1-2 Perform the indicated operations. Leave answer in simplified form.

1. $(5x-7)(3x-2)-(4x-5)(6x-1) =$ _____

2. $(3x+4y)^2-(3x-4y)^2 =$ _____

#3-10 Factor completely.

3. $5x^3 - 45x =$ _____

4. $2x^2 - 2x - 112 =$ _____

5. $4x^2 + 16x + 15 =$ _____

6. $x^3 + 6x^2 - 2x - 12 =$ _____

7. $16x^4 - 81 =$ _____

8. $8x^3 - 1 =$ _____

9. $7x^4 + 34x^2 - 5 =$ _____

10. $(x - y)^4 - 4(x - y)^2 =$ _____

#11-14 Perform the indicated operation. Leave answer in simplified form.

11. $\frac{x^3-8}{x^2-4}\cdot\frac{x+2}{3x}=$ _____

12. $\frac{x^2+x-12}{x^2+x-30}\cdot\frac{x^2+5x+6}{x^2-2x-3}\div\frac{x+3}{x^2+7x+6}=$ _____

13. $\frac{3}{5x+2}+\frac{5x}{25x^2-4}=$ _____

14. $\left(2-\frac{6}{x+1}\right)\left(1+\frac{3}{x-2}\right)=$ _____

#15-16 Simplify the complex rational expression as far as possible.

15. $\dfrac{8+\dfrac{1}{x}}{4-\dfrac{1}{x}} =$ _____

16. $\dfrac{\dfrac{6}{x^2+2x-15}-\dfrac{1}{x-3}}{\dfrac{1}{x+5}+1} =$ _____

# QUICK QUIZ #2

1. Perform the indicated operations. Simplify answer completely.

   $(3x + 5)(2x - 9) - (7x - 2)(x - 1) =$ _____

#2-5 Factor completely.

2. $3x^3 - 2x^2 - 6x + 4 =$ _____

3. $x^3 + 64 =$ _____

4. $2x^4 - 162 =$ _____

5. $6x^4 + 35x^2 - 6 =$ _____

#6-7 Perform the indicated operations. Simplify answer completely.

6. $\frac{x^3 - 25x}{4x^2} \cdot \frac{2x^2 - 2}{x^2 - 6x + 5} \div \frac{x^2 + 5x}{7x + 7} =$ _____

7. $\frac{4x^2 + x - 6}{x^2 + 3x + 2} - \frac{3x}{x + 1} + \frac{5}{x + 2} =$ _____

8. Simplify the complex rational expression as far as possible.

$$\frac{y^{-1} - (y + 2)^{-1}}{2} =$$ _____

## 3. Linear and Rational Equations

**Slope** between $(x_1, y_1)$ *and* $(x_2, y_2)$

$$m = \frac{Change\ in\ y}{Change\ in\ x} = \frac{rise}{run} = \frac{y_2 - y_1}{x_2 - x_1}$$

**Equations of Lines**

| | |
|---|---|
| **Point-Slope Form** | $y - y_1 = m(x - x_1)$ |
| **Slope-Intercept Form** | $y = mx + b$ |
| **Horizontal Line** | $y = b \quad (0, b)\ y - intercept$ |
| **Vertical Line** | $x = a \quad (a, 0)\ x - intercept$ |
| **General Form** | $Ax + By + C = 0$ |

**Parallel Lines** have the same slope.
**Perpendicular Lines** have slopes that are opposite reciprocals.

**Solving a Linear Equation**

1. Simplify the algebraic expression on each side by removing grouping symbols and combining like terms.
2. Collect all the variable terms on one side and all the constants on the other side.
3. Isolate the variable and solve.
4. Check the solution in the original equation.

## Solving a Rational Equation

1. Determine the excluded values of the variable (denominator = 0).
2. Find the LCD of all the denominators in the equation.
3. Multiply all terms on both sides of the equation by the LCD.
4. Solve.

## Section 3 Practice

1. Determine whether the line through $(2,-4)$ and $(7,0)$ is parallel to a second line through $(-4,2)$ and $(1,6)$. Show work to support your answer.

#2-5 Write the equation of the line that satisfies the given conditions in point-slope form. Then convert the equation to slope-intercept and general forms.

2. Slope $= -2$, passing through $(-4,3)$.

3. Passing through $(-1,-5)$ and $(2,1)$.

4. Passing through $(3, -4)$ and parallel to the line $3x - y - 5 = 0$.

5. Passing through $(-4, -3)$ and perpendicular to the line $2x - 5y - 10 = 0$.

6. Solve $4(x - 2) + 2 = 4x - 2(2 - x)$. Use the solution value of $x$ to evaluate $x^2 - x$.

#7-10 Solve the equation.

7. $4 - 12x = 8 - 7x - [6 \div 3(2 + 5^3) + 10x]$

8. $\frac{5}{2x} - \frac{8}{9} = \frac{1}{18} - \frac{1}{3x}$

9. $\frac{3}{x+3} = \frac{5}{2x+6} + \frac{1}{x-2}$

10. $\frac{1}{x-4} - \frac{5}{x+2} = \frac{6}{x^2-2x-8}$

# QUICK QUIZ #3

1. Find the value of $y$ if the line through the two given points has the indicated slope.

   $(-2, y)\ and\ (4, -4), m = \frac{1}{3}$

#2-3 Write the equation of the line that satisfies the given conditions in point-slope form. Then convert the equation to slope-intercept and general forms.

2. Passing through $(-8, -10)$ and parallel to the line $y = -4x + 3$.

3. Passing through $(-6,4)$ and perpendicular to the line that has $x$-intercept of $2$ and $y$-interecept of $-4$.

#4-5 Solve each equation.

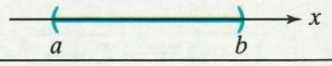
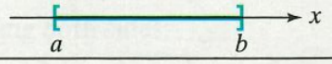
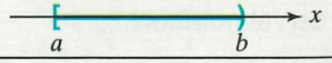
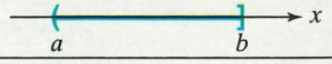
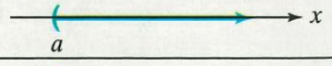
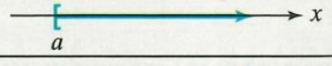
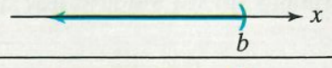
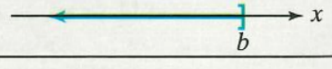
4. $4x + 13 - \left[2x - [4(x-3) - 5]\right] = 2(x-6)$

5. $\dfrac{1}{x-1} = \dfrac{1}{2x^2 + x - 3} + \dfrac{4}{2x+3}$

## 4. Linear and Absolute Value Inequalities

**Table 1.4 Intervals on the Real Number Line**

Let $a$ and $b$ be real numbers such that $a < b$.

| Interval Notation | Set-Builder Notation | Graph |
|---|---|---|
| $(a, b)$ | $\{x \mid a < x < b\}$ |  |
| $[a, b]$ | $\{x \mid a \le x \le b\}$ |  |
| $[a, b)$ | $\{x \mid a \le x < b\}$ |  |
| $(a, b]$ | $\{x \mid a < x \le b\}$ |  |
| $(a, \infty)$ | $\{x \mid x > a\}$ |  |
| $[a, \infty)$ | $\{x \mid x \ge a\}$ |  |
| $(-\infty, b)$ | $\{x \mid x < b\}$ |  |
| $(-\infty, b]$ | $\{x \mid x \le b\}$ |  |
| $(-\infty, \infty)$ | $\{x \mid x$ is a real number$\}$ or $\mathbb{R}$ (set of real numbers) |  |

To solve a **linear inequality** you may add, subtract, multiply and divide both sides by the same number. The solution is an interval.

The only difference is when you multiply or divide by a negative number you must reverse the inequality symbol.

Two inequalities connected with the word "and" may be written as a **compound inequality**. "And" means intersection.

*Example*: $-3 < 2x + 1$ and $2x + 1 \le 3 \longrightarrow -3 < 2x + 1 \le 3$

*Solution*: $-3 - 1 < 2x \le 3 - 1 \qquad \frac{-4}{2} < x < \frac{2}{2} \qquad -2 < x < 1$

**Absolute Value as Distance**

- $|x| = d$ means $x$ is $d$ units from zero on the real number line.
- $|x - a| = d$ means $x$ is $d$ units from $a$ on the real number line.
- $|x - a| < d$ means a $- d < x < a + d$
- $|x - a| > d$ means $x < a - d$ *or* $x > a + d$

*Examples:*

Solve the inequality and write the solution in inequality AND interval notation.

$-2|3x+5|+7 \geq -13$

$-2|3x+5| \geq -20$

$|3x+5| \leq 10$ (dividing by -2 reverses the inequality sign)

$-10 \leq 3x+5 \leq 10$

$-15 \leq 3x \leq 5$

$Solution: \ -5 \leq x \leq \frac{5}{3} \quad or \quad \left[-5, \frac{5}{3}\right]$

$|5-2x| > 7$

$5-2x < -7 \ \ or \ \ 5-2x > 7$ Solve each inequality separately.

$-2x < -12 \qquad -2x > 2$

$Solution: \ x > 6 \ or \ x < -1 \qquad (-\infty, -1) \cup (6, \infty)$

# Section 4 Practice

Solve the inequality and write the solution in inequality AND interval notation.

1. $-4(x+2) > 3x + 20$

2. $-3 \leq \frac{2}{3}x - 5 < -1$

3. $|3(x-1)+2| \leq 20$

4. $4 + \left|3 - \frac{x}{3}\right| > 9$

# QUICK QUIZ #4

Solve the inequality and write the solution in inequality AND interval notation.

1. $3(2x-1)-2(x-4) \geq 7+2(3+4x)$

2. $-3 \leq \frac{2x+5}{3} < 6$

3. $|2x+5|-7 < -6$

4. $-4|x+2|+5 \leq -7$

## 5. Quadratic Equations

Quadratic Equation in Standard Form: $ax^2 + bx + c = 0, a \neq 0$

**Solving Methods**

- Set = 0, factor and use the zero-product property.
  *Example:* $3x^2 + 5x - 2 = 0$
  $(3x - 1)(x + 2) = 0$
  $3x - 1 = 0 \ \ or \ \ x + 2 = 0$
  $x = \frac{1}{3} \quad or \quad x = 2$

- If the quadratic has no $x$-term, solve for $x^2$ and use the square root property.
  *Example:* $7x^2 - 4 = 0$
  $x^2 = \frac{4}{7}$
  $x = \pm\frac{2\sqrt{7}}{7}$

- Square root property with a linear factor squared.
  *Example:* $(x + 4)^2 = 5$
  $x + 4 = \pm\sqrt{5}$
  $x = -4 \pm \sqrt{5}$

- **Quadratic Formula**
  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
  *Example:* $x^2 - 2x - 6 = 0 \quad a = 1, b = -2, c = -6$
  $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-6)}}{2(1)} = \frac{2 \pm \sqrt{28}}{2}$
  $x = \frac{2 \pm 2\sqrt{7}}{2} = 1 \pm \sqrt{7}$

# Section 5 Practice

Solve each equation.

1. $3x^2 + 12x = 0$

2. $7 - 7x = (3x + 2)(x - 1)$

3. $(4x - 1)^2 = 16$

4. $x^2 + 5x + 2 = 0$

5. $\frac{1}{x^2 - 3x + 2} = \frac{1}{x + 2} + \frac{5}{x^2 - 4}$

# QUICK QUIZ #5

Solve each equation.

1. $5x^2 = 20x$

2. $(3x - 4)^2 = 18$

3. $3x^2 - 10x = 8$

4. $\dfrac{x-1}{x-2} + \dfrac{x}{x-3} = \dfrac{1}{x^2 - 5x + 6}$

# Honors Algebra 2/Precalculus H
# Summer Study Practice & Quiz Keys

## Section 1 Practice

#1-4 Use order of operations to simplify each expression. PEMDAS

1. $10^2 - 100 \div 5^2 \cdot 2 - 3$

$100 - 100 \div 25 \cdot 2 - 3$

$100 - 8 - 3 = 92 - 3 = \boxed{89}$

2. $\dfrac{(5-6)^2 - 2|3-7|}{89 - 3 \cdot 5^2}$

$\dfrac{(-1)^2 - 2|-4|}{89 - 3(25)} = \dfrac{1 - 2(4)}{89 - 75} = \dfrac{1-8}{89-75} = \dfrac{-7}{14} = \boxed{\dfrac{-1}{2}}$

3. $6 - 5[8 - (2y - 4)]$

$6 - 5(8 - 2y + 4) = 6 - 5(12 - 2y)$

$= 6 - 60 + 10y = \boxed{-54 + 10y}$

4. $14x^2 + 5 - [7(x^2 - 2) + 4]$

$14x^2 + 5 - (7x^2 - 14 + 4) = 14x^2 + 5 - 7x^2 + 10$

$= \boxed{7x^2 + 15}$

#5-6 Simplify each expression. Assume variables represent nonzero real numbers.

5. $\dfrac{(xy^{-2})^{-2}}{(x^{-2}y)^{-3}}$

$\dfrac{x^{-2}y^{4}}{x^{6}y^{-3}} = \boxed{\dfrac{y^7}{x^8}}$

6. $(3x^{-4}yz^{-7})(3x)^{-3}$

$(3x^{-4}yz^{-7})(3^{-3}x^{-3})$

$= 3^{-2}x^{-7}yz^{-7}$

$= \boxed{\dfrac{y}{9x^7z^7}}$

7. Consider the set $\left\{-17, -\frac{9}{13}, 0, 0.75, \sqrt{2}, \pi, \sqrt{81}\right\}$. List all the numbers in the set that are

a) Natural numbers $\sqrt{81}$

b) Whole numbers $0, \sqrt{81}$

c) Integers $-17, 0, \sqrt{81}$

d) Rational numbers $-17, -\frac{9}{13}, 0, 0.75, \sqrt{81}$

e) Irrational numbers $\sqrt{2}, \pi$

f) Real numbers $-17, -\frac{9}{13}, 0, 0.75, \sqrt{2}, \pi, \sqrt{81}$

8. Let $A = \{a, b, c\}$ and $B = \{a, c, d, e\}$. Find the indicated set.

a) $A \cap B = \{a, c\}$

b) $A \cup B = \{a, b, c, d, e\}$

**Simplest radical form:**

- No integer under the radical sign with a perfect square factor
- No fractions under the radical sign
- No radicals in the denominator

9. $\sqrt{(-17)^2} =$ 17 $\sqrt{}$ is positive or principal root

#10 - 12 Simplify the expression.

10. $3\sqrt{54} - 2\sqrt{24} - \sqrt{96} + 4\sqrt{63}$

$= 3\sqrt{9}\sqrt{6} - 2\sqrt{4}\sqrt{6} - \sqrt{16}\sqrt{6} + 4\sqrt{9}\sqrt{7}$

$= 9\sqrt{6} - 4\sqrt{6} - 4\sqrt{6} + 12\sqrt{7} = \sqrt{6} + 12\sqrt{7}$

11. $\dfrac{2}{\sqrt{10}}$

$\frac{2}{\sqrt{10}} \cdot \frac{\sqrt{10}}{\sqrt{10}} = \frac{2\sqrt{10}}{10} = \boxed{\frac{\sqrt{10}}{5}}$

12. $\dfrac{11}{\sqrt{7}-\sqrt{3}} \cdot \dfrac{\sqrt{7}+\sqrt{3}}{\sqrt{7}+\sqrt{3}}$ (conjugate / conjugate)

$= \frac{11\sqrt{7}+11\sqrt{3}}{7-3} = \boxed{\frac{11\sqrt{7}-11\sqrt{3}}{4}}$

# 14 - 16 Simplify the expression. Assume that the variables represent positive real numbers.

14. $\sqrt{10x} \cdot \sqrt{8x^2}$ $= \sqrt{80x^3} = \sqrt{16x^2} \cdot \sqrt{5x} = \boxed{4x\sqrt{5x}}$

15. $\dfrac{\sqrt{500x^3}}{\sqrt{10x^{-1}}}$ $= \sqrt{50x^4} = \sqrt{25x^4}\sqrt{2} = \boxed{5x^2\sqrt{2}}$

16. $\dfrac{\left(2y^{\frac{1}{5}}\right)^4}{y^{\frac{3}{10}}}$ $= \frac{16y^{\frac{4}{5}}}{y^{\frac{3}{10}}} = 16y^{\frac{4}{5}-\frac{3}{10}} = \boxed{16y^{\frac{1}{2}} \text{ or } 16\sqrt{y}}$

# 17 – 18 Evaluate each expression.

17. $64^{\frac{2}{3}}$

$\left(\sqrt[3]{64}\right)^2 = 4^2 = \boxed{16}$

18. $27^{-\frac{4}{3}}$

$= \frac{1}{\left(\sqrt[3]{27}\right)^4} = \frac{1}{3^4} = \boxed{\frac{1}{81}}$

- **Simplifying a Complex Fraction**

  1. Find the LCD of all the fractions within the numerator and denominator.
  2. Multiply by a "well-chosen one" of this LCD/LCD.

$$Example: \frac{\frac{1}{x}-\frac{1}{2}}{\frac{1}{3}-\frac{x}{6}} \quad LCD\ is\ 6x. \quad \frac{\frac{1}{x}-\frac{1}{2}}{\frac{1}{3}-\frac{x}{6}} \cdot \frac{6x}{6x} = \frac{\frac{6x}{x}-\frac{6x}{2}}{\frac{6x}{3}-\frac{6x^2}{6}} = \frac{6-3x}{2x-x^2}$$

## Section 2 Practice

#1-2 Perform the indicated operations. Leave answer in simplified form.

1. $(5x-7)(3x-2)-(4x-5)(6x-1) =$ $-9x^2+3x+9$

$(15x^2-10x-21x+14)-(24x^2-4x-30x+5)$

$(15x^2-31x+14)-(24x^2-34x+5)$

2. $(3x+4y)^2-(3x-4y)^2 =$ $48xy$

$(9x^2+24xy+16y^2)-(9x^2-24xy+16y^2)$

#3-10 Factor completely.

3. $5x^3 - 45x =$ $5x(x-3)(x+3)$

$5x(x^2-9)$

4. $2x^2 - 2x - 112 =$ $2(x-8)(x+7)$

$2(x^2-x-56)$

5. $4x^2 + 16x + 15 =$ $(2x+3)(2x+5)$

$(2x + 3)(2x + 5)$ (6x, 10x)

6. $x^3 + 6x^2 - 2x - 12 =$ $(x^2-2)(x+6)$

$x^2(x+6) - 2(x+6)$

or $(x-\sqrt{2})(x+\sqrt{2})(x+6)$ ☺

7. $16x^4 - 81 =$ $(4x^2+9)(2x+3)(2x-3)$

$(4x^2+9)(4x^2-9)$

8. $8x^3 - 1 =$ $(2x-1)(4x^2+2x+1)$

$A = 2x$, $B = 1$ $\quad (A-B)(A^2+AB+B^2)$

9. $7x^4 + 34x^2 - 5 =$ $(7x^2-1)(x^2+5)$

$(7x^2 - 1)(x^2 + 5)$

10. $(x-y)^4 - 4(x-y)^2 =$ $(x-y)^2(x-y-2)(x-y+2)$

$(x-y)^2\left[(x-y)^2 - 4\right] = (x-y)^2(x-y-2)(x-y+2)$

GCF; diff. of sq's

#11-14 Perform the indicated operation. Leave answer in simplified form.

11. $\dfrac{x^3-8}{x^2-4}\cdot\dfrac{x+2}{3x}=$ _____

$\dfrac{x^2+2x+4}{3x}$

$\dfrac{(x-2)(x^2+2x+4)(x+2)}{(x+2)(x+2)3x}$

12. $\dfrac{x^2+x-12}{x^2+x-30}\cdot\dfrac{x^2+5x+6}{x^2-2x-3}\div\dfrac{x+3}{x^2+7x+6}=$ _____

$\dfrac{x^2+6x+8}{x-5}$

$\dfrac{(x+4)(x-3)}{(x+6)(x-5)}\cdot\dfrac{(x+2)(x+3)}{(x+3)(x+1)}\cdot\dfrac{(x+1)(x+6)}{(x+3)} = \dfrac{(x+4)(x+2)}{x-5}$

13. $\dfrac{3}{5x+2}+\dfrac{5x}{25x^2-4}=$ _____

$\dfrac{20x-6}{25x^2-4}$

$\dfrac{3}{(5x+2)}\cdot\dfrac{(5x-2)}{(5x-2)}+\dfrac{5x}{(5x+2)(5x-2)} = \dfrac{15x-6+5x}{(5x+2)(5x-2)} = \dfrac{20x-6}{25x^2-4}$

14. $\left(2-\dfrac{6}{x+1}\right)\left(1+\dfrac{3}{x-2}\right)=$ _____

2

$= \left[\dfrac{2(x+1)}{x+1}-\dfrac{6}{x+1}\right]\left[\dfrac{x-2}{x-2}+\dfrac{3}{x-2}\right]$

$= \left[\dfrac{2x+2-6}{x+1}\right]\left[\dfrac{x+1}{x-2}\right] = \left(\dfrac{2x-4}{x+1}\right)\left(\dfrac{x+1}{x-2}\right) = \dfrac{2(x-2)(x+1)}{(x+1)(x-2)} = 2$

#15-16 Simplify the complex rational expression as far as possible.

15. $\dfrac{8+\frac{1}{x}}{4-\frac{1}{x}} =$ _____

$\frac{8x+1}{4x-1}$

$\frac{x}{x} \cdot \frac{\left(8+\frac{1}{x}\right)}{\left(4-\frac{1}{x}\right)}$

16. $\dfrac{\frac{6}{x^2+2x-15}-\frac{1}{x-3}}{\frac{1}{x+5}+1} =$ _____

$\frac{1-x}{x^2+3x-18}$

$\left(\dfrac{\frac{6}{(x+5)(x-3)}-\frac{1}{(x-3)}}{\frac{1}{(x+5)}+1}\right)^{(x+5)(x-3)}$

LCD: $(x+5)(x-3)$

$= \dfrac{6-(x+5)}{(x-3)+(x+5)(x-3)}$

$= \dfrac{1-x}{x-3+x^2+2x-15}$

$= \dfrac{1-x}{x^2+3x-18}$

**Solving a Rational Equation**

1. Determine the excluded values of the variable (denominator = 0).
2. Find the LCD of all the denominators in the equation.
3. Multiply all terms on both sides of the equation by the LCD.
4. Solve.

## Section 3 Practice

1. Determine whether the line through $(2,-4)$ and $(7,0)$ is parallel to a second line through $(-4,2)$ and $(1,6)$. Show work to support your answer.

$m_1 = \frac{0-(-4)}{7-2} = \frac{4}{5}$ $\quad m_2 = \frac{6-2}{1-(-4)} = \frac{4}{5}$ yes

#2-5 Write the equation of the line that satisfies the given conditions in point-slope form. Then convert the equation to slope-intercept and general forms.

2. Slope $= -2$, passing through $(-4,3)$.

$y = -2x - 8 + 3$

$y - 3 = -2(x+4)$ pt-slope

$y = -2x - 5$ slope-intercept

$2x + y + 5 = 0$ general

3. Passing through $(-1,-5)$ and $(2,1)$.

$m = \frac{1+5}{2+1} = \frac{6}{3} = 2$

$y = 2x - 4 + 1$

$y - 1 = 2(x-2)$ or $y + 5 = 2(x+1)$

$y = 2x - 3$

$2x - y - 3 = 0$

4. Passing through $(3, -4)$ and parallel to the line $3x - y - 5 = 0$. → $y = 3x - 5$, $m = 3$

$y + 4 = 3(x - 3)$

$y = 3x - 13$

$3x - y - 13 = 0$

$y = 3x - 9 - 4$

5. Passing through $(-4, -3)$ and perpendicular to the line $2x - 5y - 10 = 0$.

$y + 3 = -\frac{5}{2}(x + 4)$

$y = -\frac{5}{2}x - 13$

$5x + 2y + 26 = 0$

$y = -3 - \frac{5}{2}x - 10$

$2y = -5x - 26$

$5y = 2x - 10$

$y = \frac{2}{5}x - 2$ $\quad m = \frac{2}{5}$

So $m_{\perp} = -\frac{5}{2}$

6. Solve $4(x - 2) + 2 = 4x - 2(2 - x)$. Use the solution value of $x$ to evaluate $x^2 - x$.

$4x - 8 + 2 = 4x - 4 + 2x$

$4x - 6 = 6x - 4$

$-2 = 2x$

$x = -1$

$(-1)^2 - (-1)$

$= 1 + 1$

$= 2$

#7-10 Solve the equation.

7. $4 - 12x = 8 - 7x - [6 \div 3(2 + 5^3) + 10x]$

$4 - 12x = 8 - 7x - (2(127) + 10x)$

$4 - 12x = 8 - 7x - (254 + 10x)$

$4 - 12x = 8 - 7x - 254 - 10x$

$4 - 12x = -246 - 17x$

$5x = -250$

$x = -50$

8. $\frac{5}{2x} - \frac{8}{9} = \frac{1}{18} - \frac{1}{3x}$ $x \neq 0$

LCD : $18x$

$18x\left(\frac{5}{2x} - \frac{8}{9}\right) = 18x\left(\frac{1}{18} - \frac{1}{3x}\right)$

$9(5) - 2x(8) = x - 6$

$45 - 16x = x - 6$

$51 = 17x$

$\boxed{x = 3}$

9. $\frac{3}{x+3} = \frac{5}{2x+6} + \frac{1}{x-2}$

$2(x+3)$

LCD : $2(x+3)(x-2)$ $x \neq -3, 2$

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

$6x - 12 = 5x - 10 + 2x + 6$

$6x - 12 = 7x - 4$

$\boxed{-8 = x}$

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

10. $\frac{1}{x-4} - \frac{5}{x+2} = \frac{6}{x^2 - 2x - 8}$

$(x-4)(x+2)$

LCD : $(x-4)(x+2)$ $x \neq 4, -2$

$(x-4)(x+2)\frac{1}{x-4} - (x-4)(x+2)\cdot\frac{5}{x+2} = (x-4)(x+2)\cdot\frac{6}{(x-4)(x+2)}$

$x + 2 - 5(x-4) = 6$

$x + 2 - 5x + 20 = 6$

$-4x + 22 = 6$

$-4x = -16$

$\boxed{x = 4 \text{ since } x \neq 4 \text{ there is no solution}}$

## Section 4 Practice

Solve the inequality and write the solution in inequality AND interval notation.

1. $-4(x+2) > 3x + 20$

$-4x - 8 > 3x + 20$

$-8 - 20 > 3x + 4x$

$-28 > 7x$

$-4 > x$

$x < -4$

$(-\infty, -4)$

2. $-3 \leq \frac{2}{3}x - 5 < -1$

$2 \leq \frac{2}{3}x < 4$

$\frac{3}{2} \cdot 2 \leq x < 4 \cdot \frac{3}{2}$

$3 \leq x < 6$

$[3, 6)$

3. $|3(x-1)+2| \leq 20$

$|3x - 3 + 2| \leq 20$

$|3x - 1| \leq 20$

$-20 \leq 3x - 1 \leq 20$

$-19 \leq 3x \leq 21$

$-\frac{19}{3} \leq x \leq 7$

$\left[-\frac{19}{3}, 7\right]$

4. $4 + \left|3 - \frac{x}{3}\right| > 9$

$\left|3 - \frac{x}{3}\right| > 5$

$3 - \frac{x}{3} < -5$ or $3 - \frac{x}{3} > 5$

$-\frac{x}{3} < -8$ $\quad -\frac{x}{3} > 2$

$x > 24$ or $x < -6$

$x < -6$ or $x > 24$

$(-\infty, -6) \cup (24, \infty)$

## Section 5 Practice

Solve each equation.

1. $3x^2 + 12x = 0$

$3x(x+4) = 0$

$x = 0$ or $x = -4$

2. $7 - 7x = (3x + 2)(x - 1)$

$7 - 7x = 3x^2 - x - 2$

$0 = 3x^2 + 6x - 9 = 3(x^2 + 2x - 3) = 3(x+3)(x-1)$

$x = -3$ or $x = 1$

3. $(4x - 1)^2 = 16$

$4x - 1 = \pm 4$

$4x - 1 = 4$ $\quad$ $4x - 1 = -4$

$4x = 5$ $\quad$ $4x = -3$

$x = \frac{5}{4}$ or $x = -\frac{3}{4}$

4. $x^2 + 5x + 2 = 0$

Doesn't factor

So use Quadratic Formula

$a = 1, b = 5, c = 2$

$x = \frac{-5 \pm \sqrt{25 - 4(1)(2)}}{2}$

$x = \frac{-5 \pm \sqrt{17}}{2}$

5. $\frac{1}{x^2 - 3x + 2} = \frac{1}{x + 2} + \frac{5}{x^2 - 4}$

$(x-1)(x-2)$ $\quad$ $(x-2)(x+2)$

$x \neq 1, \pm 2$

LCD: $(x-1)(x-2)(x+2)$

mult. both sides by

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

$x + 2 = x^2 - 3x + 2 + 5x - 5$

$0 = x^2 + x - 5$

doesn't factor

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

$x = \frac{-1 \pm \sqrt{21}}{2}$

# QUICK QUIZ #1

1. List all the rational numbers in this set:

$$\left\{-7, -\frac{4}{5}, 0, 0.25, \sqrt{3}, \sqrt{4}, \frac{22}{7}, \pi\right\}$$

$-7, -\frac{4}{5}, 0, 0.25, \sqrt{4}, \frac{22}{7}$

#2 - 8 Simplify the given expression or perform the indicated operation. Simplify when possible.

2. $\dfrac{12 \div 3 \cdot 5|2^2 + 3^2|}{7 + 3 - 6^2}$

$-10$

$\dfrac{12 \div 3 \cdot 5(13)}{7+3-36} = \dfrac{4 \cdot 5 \cdot 13}{10 - 36} = \dfrac{260}{-26}$

3. $7 + 2[3(x + 1) - 2(3x - 1)]$

$17 - 6x$

$7 + 2(3x + 3 - 6x + 2)$

$7 + 2(-3x + 5) = 7 - 6x + 10$

4. $\left(\dfrac{-30a^{14}b^{8}}{10a^{17}b^{-2}}\right)^{3}$

$-\dfrac{27b^{30}}{a^{9}}$

$\left(\dfrac{-3b^{10}}{a^{3}}\right)^{3}$

5. $8^{-\frac{5}{3}} =$

$\dfrac{1}{32}$

$\dfrac{1}{(\sqrt[3]{8})^{5}} = \dfrac{1}{2^{5}}$

6. $3\sqrt{8} - \sqrt{32} + 3\sqrt{72} - \sqrt{75} =$ $20\sqrt{2} - 5\sqrt{3}$

$3\sqrt{4}\sqrt{2} - \sqrt{16}\sqrt{2} + 3\sqrt{36}\sqrt{2} - \sqrt{25}\sqrt{3}$

$6\sqrt{2} - 4\sqrt{2} + 18\sqrt{2} - 5\sqrt{3}$

7. $\sqrt{6x} \cdot \sqrt{3x^2} + \dfrac{\sqrt{24x^4}}{\sqrt{3x}} =$ $5\sqrt{2}x\sqrt{x}$ or $5x\sqrt{2x}$

$\sqrt{18x^3} + \sqrt{8x^3}$

$\sqrt{9x^2}\sqrt{2}\sqrt{x} + \sqrt{4x^2}\sqrt{2}\sqrt{x}$

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

8. $\sqrt{13 + \sqrt{2} + \dfrac{7}{3 + \sqrt{2}}} =$ 4

$= \sqrt{13 + \sqrt{2} + \dfrac{7}{3+\sqrt{2}} \cdot \dfrac{3-\sqrt{2}}{3-\sqrt{2}}}$

$= \sqrt{13 + \sqrt{2} + \dfrac{21 - 7\sqrt{2}}{9-2}}$

$= \sqrt{13 + \sqrt{2} + \dfrac{21}{7} - \dfrac{7\sqrt{2}}{7}}$

$= \sqrt{16}$

# QUICK QUIZ #2

1. Perform the indicated operations. Simplify answer completely.

$(3x+5)(2x-9)-(7x-2)(x-1)=$ $-x^2-8x-47$

$6x^2-27x$ $\quad +10x-45$ $\qquad 7x^2-7x$ $\quad -2x+2$

$6x^2-17x-45-(7x^2-9x+2)$

#2-5 Factor completely.

2. $3x^3-2x^2-6x+4=$ $(x^2-2)(3x-2)$

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

3. $x^3+64=$ $(x+4)(x^2-4x+16)$

4. $2x^4-162=$ $2(x^2+9)(x+3)(x-3)$

$2(x^4-81)$

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

5. $6x^4+35x^2-6=$ $(6x^2-1)(x^2+6)$

$(6x^2-1)(x^2+6)$

$-x^2$

$+36x^2$

#6-7 Perform the indicated operations. Simplify answer completely.

6. $\dfrac{x^3-25x}{4x^2}\cdot\dfrac{2x^2-2}{x^2-6x+5}\div\dfrac{x^2+5x}{7x+7}=$ $\dfrac{7(x+1)^2}{2x^2}$ or $\dfrac{7x^2+14x+7}{2x^2}$

$\dfrac{x(x-5)(x+5)}{4x^2}\cdot\dfrac{2(x-1)(x+1)}{(x-1)(x-5)}\cdot\dfrac{7(x+1)}{x(x+5)}$ $= \dfrac{7(x+1)^2}{2x^2}$ $= \dfrac{7x^2+14x+7}{2x^2}$

7. $\dfrac{4x^2+x-6}{x^2+3x+2}-\dfrac{3x}{x+1}+\dfrac{5}{x+2}=$ $\dfrac{x-1}{x+2}$

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

$\dfrac{4x^2+x-6}{(x+1)(x+2)} - \dfrac{3x}{(x+1)}\dfrac{(x+2)}{(x+2)} + \dfrac{5}{(x+2)}\dfrac{(x+1)}{(x+1)}$

$\dfrac{4x^2+x-6-3x^2-6x+5x+5}{(x+1)(x+2)} = \dfrac{x^2-1}{(x+1)(x+2)} = \dfrac{(x+1)(x-1)}{(x+1)(x+2)}$

8. Simplify the complex rational expression as far as possible.

$\dfrac{y^{-1}-(y+2)^{-1}}{2}=$ $\dfrac{1}{y^2+2y}$

$\dfrac{\left(\frac{1}{y}-\frac{1}{y+2}\right)}{2}\cdot\dfrac{(y+2)(y)}{(y+2)(y)} = \dfrac{y+2-y}{2y(y+2)} = \dfrac{2}{2y(y+2)}$

$= \dfrac{1}{y(y+2)}$

# QUICK QUIZ #3

1. Find the value of $y$ if the line through the two given points has the indicated slope.

$$(-2, y) \text{ and } (4, -4), m = \frac{1}{3}$$

$\frac{-4-y}{4+2} = \frac{1}{3}$ $\quad 6 \cdot \frac{-4-y}{6} = \frac{1}{3} \cdot 6$ $\quad \boxed{y = -6}$

$-4 - y = 2$

$-y = 6$

#2-3 Write the equation of the line that satisfies the given conditions in point-slope form. Then convert the equation to slope-intercept and general forms.

2. Passing through $(-8, -10)$ and parallel to the line $y = -4x + 3$. $\quad m = -4$

$y + 10 = -4(x + 8)$

$y = -4x - 42$

$4x + y + 42 = 0$

$y = -10 - 4x - 32$

3. Passing through $(-6, 4)$ and perpendicular to the line that has $x$-intercept of 2 and $y$-interecept of $-4$.

$y - 4 = -\frac{1}{2}(x + 6)$

$y = -\frac{1}{2}x + 1$

$x + 2y - 2 = 0$

$y = 4 + -\frac{1}{2}x - 3$

$2y = -x + 2$

$(2, 0)$

$(0, -4)$

$m = \frac{-4}{-2} = 2$

$m_{\perp} = -\frac{1}{2}$

#4-5 Solve each equation.

4. $4x + 13 - [2x - [4(x-3) - 5]] = 2(x-6)$

$4x + 13 - [2x - (4x - 12 - 5)] = 2x - 12$

$4x + 13 - [-2x + 17] = 2x - 12$

$4x + 13 + 2x - 17 = 2x - 12$

$6x - 4 = 2x - 12$

$4x = -8$

$\boxed{x = -2}$

5. $\dfrac{1}{x-1} = \dfrac{1}{2x^2 + x - 3} + \dfrac{4}{2x+3}$

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

LCD : $(2x+3)(x-1)$

mult. every term

all den's cancel

$x \neq 1, -\frac{3}{2}$

$2x + 3 = 1 + 4(x-1)$

$2x + 3 = 1 + 4x - 4$

$2x + 3 = 4x - 3$

$6 = 2x$

$\boxed{x = 3}$

# QUICK QUIZ #4

Solve the inequality and write the solution in inequality AND interval notation.

1. $3(2x-1)-2(x-4) \geq 7+2(3+4x)$

$6x-3-2x+8 \geq 7+6+8x$

$4x+5 \geq 13+8x$

$4x-8x \geq 13-5$

$-4x \geq 8$

$x \leq -2$

$(-\infty, -2]$

2. $-3 \leq \dfrac{2x+5}{3} < 6$

$-9 \leq 2x+5 < 18$

$-14 \leq 2x < 13$

$-7 \leq x < \frac{13}{2}$

$-7 \leq x < \frac{13}{2}$

$[-7, \frac{13}{2})$

3. $|2x+5|-7 < -6$

$|2x+5| < 1$

$-1 < 2x+5 < 1$

$-6 < 2x < -4$

$-3 < x < -2$

$-3 < x < -2$

$(-3, -2)$

4. $-4|x+2|+5 \leq -7$

$-4|x+2| \leq -12$

$|x+2| \geq 3$

$x+2 \leq -3$ or $x+2 \geq 3$

$x \leq -5$ or $x \geq 1$

$x \leq -5$ or $x \geq 1$

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

# QUICK QUIZ #5

Solve each equation.

1. $5x^2 = 20x$

you can't ÷ by x since it could equal zero ☺

$5x^2 - 20x = 0$

$5x(x-4) = 0$

$x = 0$ or $x = 4$

2. $(3x-4)^2 = 18$

$3x - 4 = \pm\sqrt{18} = \pm 3\sqrt{2}$

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

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

3. $3x^2 - 10x = 8$

$3x^2 - 10x - 8 = 0$

$(3x + 2)(x - 4) = 0$

$3x = -2 \quad x = 4$

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

4. $\frac{x-1}{x-2} + \frac{x}{x-3} = \frac{1}{x^2-5x+6}$

$(x-2)(x-3)$

$x \neq 2, 3$ LCD: $(x-2)(x-3)$

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

$x^2 - 4x + 3 + x^2 - 2x - 1 = 0$

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

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

doesn't factor

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

$x = \frac{3 \pm \sqrt{5}}{2}$