

Algebra II

SOL Folder

Expressions & Operations

Expressions & Operations

All.1 The student, given rational, radical, or polynomial expressions, will
a) add, subtract, multiply, divide, and simplify rational algebraic expressions;

Notes and Formulas:

To add or subtract: Must have a common denominator

To multiply: Factor numerator, factor denominator, cancel common factors

To divide: Flip the fraction after the division sign and use multiplication rules

To simplify: factor numerator, factor denominator, cancel common factors – NO CHOPPING !!

Complex Fractions: Simplify numerator, simplify denominator, then divide

Examples:

1. Which is equivalent to $\frac{x^2 - 4}{x^2 - 4x + 4}$?

A $\frac{1}{x+1}$

B $\frac{x+2}{x-2}$

C $\frac{1}{4x}$

D $\frac{1}{x+4}$

2. Which is equivalent to

$$\frac{6a+12}{a} \cdot \frac{a^3}{a+2} = ?$$

F $6a^2$

G $\frac{6}{a^2}$

H $\frac{6(a+2)}{a}$

J $\frac{6a^2 + 24a + 24}{a^4}$

3. Which is equivalent to $\frac{3x}{7} + \frac{5y}{14x}$?

A $\frac{8y}{21}$

B $\frac{x^2}{14}$

C $\frac{6x^2 + 5y}{14x}$

D $\frac{3x^2 + 5y}{14x}$

4. Which is equivalent to $\frac{\frac{x}{x+7}}{\frac{x-9}{x+7}}$?

F -9

G $\frac{x^2 - 9x}{(x+7)^2}$

H $\frac{x}{x-9}$

J $\frac{-1}{9}$

5. Which is equivalent to $\frac{\frac{1}{2} - \frac{4}{5}}{\frac{x}{x} + \frac{y}{y}}$?

A $\frac{x-4y}{5x+2y}$

B $\frac{y-4x}{2y+5x}$

C $\frac{x^2y^2}{(y-4x)(2y+5x)}$

D $2y^2 - 3xy - 20x^2$

6. Which is equivalent to $\frac{(a+b)^3}{18} \cdot \frac{2}{(a+b)^2}$?

F $\frac{a+b}{9}$

G $\frac{(a+b)^2}{9}$

H $\frac{(a+b)^5}{36}$

J $18a + 9b$

All.1 The student, given rational, radical, or polynomial expressions, will
 b) add, subtract, multiply, divide, and simplify radical expressions containing rational numbers and variables, and expressions containing rational exponents;
 c) write radical expressions as expressions containing rational exponents and vice versa

Notes and Formulas:

$\sqrt[b]{x^a} = x^{\frac{a}{b}}$ Remember: "Denominator in Dip"

To add or subtract radicals: Radicands must be the same. You may only add like radicals.

Always simplify your radical completely.

Pay attention to your root value. Everything is not a square root.

Examples:

1. Which expression is equivalent to $\sqrt[3]{a^2}$?

A $a^{\frac{3}{2}}$

B $a^{\frac{2}{3}}$

C $a^{\frac{1}{6}}$

D a^6

2. Which is equivalent to $\sqrt[3]{8x^6}$?

F 2

G 2x

H $2x^2$

J $2x^3$

3. Which is equivalent to $16^{\frac{3}{4}}$?

- A 4
- B 8
- C 12
- D 32

4. Which is equivalent to $a^{\frac{1}{2}}b^{\frac{3}{4}}$?

- F ab^3
- G $\sqrt{ab^3}$
- H $\sqrt[3]{a^2b^4}$
- J $\sqrt[4]{a^2b^3}$

5. Which is equivalent to $2\sqrt{12} + 3\sqrt{3}$?

- A $16\frac{1}{2}$
- B $5\sqrt{15}$
- C $7\sqrt{3}$
- D $7\sqrt{6}$

6. What is the simplest form of

$$\sqrt{72x^3} - 5x\sqrt{2x} ?$$

- F $x\sqrt{2x}$
- G $\sqrt{2x}$
- H $2x\sqrt{x}$
- J $x^2\sqrt{2x}$

7. What is the value of $\left(\frac{5^5}{2^5}\right)^{-\frac{1}{5}}$?

- A $5/2$
- B $25/4$
- C $2/5$
- D $4/25$

8. Which is equivalent to the expression

$$\sqrt[3]{16} + 3\sqrt[3]{54} - 2\sqrt[3]{81} ?$$

- F $11\sqrt[3]{2} - 6\sqrt[3]{3}$
- G $11\sqrt[3]{2} - 2\sqrt[3]{3}$
- H $2\sqrt[3]{2}$
- J $5\sqrt[3]{2} - 6\sqrt[3]{3}$

**All.1 The student, given rational, radical, or polynomial expressions, will
d) factor polynomials completely**

Notes and Formulas

Always look for a greatest common factor first $xy + xw = x(y+w)$

Look for patterns: $a^2 - b^2 = (a + b)(a - b)$ $a^2 + 2ab + b^2 = (a+b)^2$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$
square-multiply-square-opposite-plus ***make sure you have that opposite
sign in the second factor

You can multiply or "foil" your choices to work backwards, if you want to work backwards.

Examples:

1. Which is a factored form of $9x^2 - 25$?

- A $(3x - 5)(3x + 5)$
- B $(3x - 5)^2$
- C $(3x + 5)^2$
- D $(9x - 25)^2$

2. Which is a factor of $16x^2 - 1$?

- F $(x - 1)$
- G $(4x + 1)$
- H $(8x - 1)$
- J $4x$

3. Which is a factor of $x^2 - 2x - 15$?

- A $(x - 3)$
- B $(x - 15)$
- C $(x + 3)$
- D $(x + 5)$

4. Which is a factor of $6a^2 + 5ab - 6b^2$?

- F $(2a + 3b)$
- G $(2a - 3b)$
- H $(3a + 2b)$
- J $(3a + 3b)$

5. Which is a factored form of $8x^3 + 1$?

- A $(2x - 1)(4x^2 - 2x + 1)$
- B $(2x - 1)(4x^2 + 2x - 1)$
- C $(2x + 1)(4x^2 - 2x + 1)$
- D $(2x + 1)(4x^2 + 2x - 1)$

6. Which is a factored form of $1 - y^3$?

- F $(1 - y)(1 - y - y^2)$
- G $(1 - y)(1 + y + y^2)$
- H $(1 + y)(1 - y - y^2)$
- J $(1 + y)(1 + y + y^2)$

7. Which represents the complete factorization of $4x^2 - 14x - 8$?

A $2(2x-1)(x+4)$

B $2(2x+4)(x-1)$

C $2(2x+1)(x-4)$

D $2(2x-1)(x-4)$

8. Given the area of a rectangle is $2x^2 + 5x - 12$.

Which of the following could represent the length of one side of the rectangle?

F $2x + 3$

G $2x - 3$

H $x - 4$

J $x + 12$

All.3 The student will perform operations on complex numbers, express the results in simplest form using patterns of the powers of i , and identify field properties that are valid for the complex numbers.

Notes and Formulas:

Use your i button on your calculator.

Remember to include your parentheses. If $\frac{2+i}{3+i}$, you must put in $(2+i) \div (3+i)$

Remember: $i^2 = -1$ Always change your i^2 to -1 if working out by hand.

Examples:

1. Which expression is equivalent to

$$(6 + 2i) - (4 + 3i)?$$

A $2 - i$

B $2 + i$

C $2 + 5i$

D $10 - i$

2. Which is equivalent to $(4 - 2i)(5 + 3i)$?

F 26

G 12

H $14 + 2i$

J $26 + 2i$

3. Which is equivalent to $(4-3i)^2$?

A 25

B $25-2i$

C 7

D $7-24i$

4. Which is equivalent to $(3+2i)(2+5i)$?

F $-4+19i$

G $16+19i$

H $6+29i$

J $6-10i$

5. Which is equivalent to $\frac{5+i}{1+3i}$?

A $\frac{4-8i}{5}$

B $\frac{4-7i}{5}$

C $\frac{1-7i}{5}$

D $\frac{-1-7i}{4}$

6. Which is equivalent to $\sqrt{3} \cdot \sqrt{-3}$?

F $3i$

G $-3i$

H 9

J $9i$

7. What number does i^{24} equal?

A i

B -1

C $-i$

D 1

8. TEQ

Write the answer to the expression $(4+2i)(4-2i)$ in the box below.

Equations & Inequalities

Equations & Inequalities

All/T.4 The student will solve, algebraically and graphically,
a) absolute value equations and inequalities
Graphing calculators will be used for solving and for confirming the algebraic solutions.

Notes and Formulas:

An absolute value equation or inequality makes TWO statements.

Shading of Graphs: $|absolutevalue| \leq number$ "AND" sentence (Less than or equal to)

Look for graph shaded between 2 numbers and closed circles

$|absolutevalue| < number$ "AND" sentence (Less than only)

Look for graph shaded between 2 numbers and open circles

$|absolutevalue| \geq number$ "OR" sentence (Greater than or equal to)

Look for graph shaded to the left and to the right, closed circles

$|absolutevalue| > number$ "OR" sentence (Greater than only)

Look for graph shaded to the left and to the right, open circles

Practice Problems:

___ 1. Which of the following represents

the solution to $|x| = 7$?

- A $x = 7$
- B $x = 0$
- C $x = -7$
- D $x = -7$ or $x = 7$

___ 2 .



Which inequality describes the solution set graphed above?

- F $|x - 3| > 1$
- G $|2x - 5| < 3$
- H $|4x - 9| \geq 2$
- J $|5x - 13| \leq 5$

___3. What is the solution to $|2x - 3| - 1 < 3$?

A $\frac{-1}{2} < x < \frac{7}{2}$

B $\frac{-7}{2} < x < \frac{7}{2}$

C $x > \frac{-1}{2}$ or $x < \frac{7}{2}$

D $x = \frac{-1}{2}$ or $x = \frac{7}{2}$

___4 Which best represents the graph of

$$2|2x - 1| > 10 ?$$

F



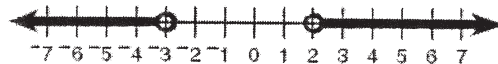
G



H



J



___5



Which inequality describes the solution set graphed above?

A $|3x - 4| \geq 8$

B $|3x - 4| < 8$

C $|2x - 3| > 5$

D $|2x - 3| \leq 5$

___6. What is the solution set for

$$|2x + 5| = 7 ?$$

A $\{-6, 1\}$

B $\{-1, 1\}$

C $\{-6\}$

D $\{1\}$

___7.



Which of the following inequalities best represents the graph above?

A $|x - 1| < 3$

B $|x - 7| < 4$

C $|x + 3| < 7$

D $|x + 3| < 4$

**All/T.4 The student will solve, algebraically and graphically,
 b) quadratic equations over the set of complex numbers
 Graphing calculators will be used for solving and for confirming the algebraic solutions.**

Notes and Formulas:

Ways to solve a quadratic eqt.: **Put equation in $ax^2 + bx + c = 0$ form**

1. Factor, set each factor equal to zero, find solutions
2. Use quadratic formula: $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
3. Square Root both sides if a squared term is isolated on one side
4. Use your calculator: Sketch in y=
 - Zoom 6
 - Look for zeros(x-intercepts)
5. Work backwards – “Plug it in !!!!”
 - Substitute given answer choices into your calc and see what works

Know terminology: Solutions, zeros, roots, x-intercepts all mean the same thing

$\sqrt{\text{negative}}$ Always “pull the i out” first before you simplify your radical

Practice Problems:

___ 1. What is the solution set for

$$x^2 + 6x - 16 = 0?$$

- A {0, 4}
- B {-8, 2}
- C {-3, 5}
- D {-2, 8}

___ 2. Which is the solution set for

$$x^2 - 4x = 8?$$

- F $\{2 \pm 2\}$
- G $\{2 \pm 2\sqrt{3}\}$
- H {4, 2}
- H {-4, 2}

___ 3. Which is the solution set for

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

- A $\left\{\pm \frac{1}{2}\right\}$
- B $\left\{\frac{-1}{2} \pm \frac{1}{2}i\right\}$
- C $\left\{\frac{-1}{2} \pm i\right\}$
- D $\{-1 \pm i\}$

___ 4. What are the solutions to

$$(y+3)^2 - 81 = 0?$$

- F $y = -12$ or $y = -6$
- G $y = -12$ or $y = 6$
- H $y = 12$ or $y = -6$
- J $y = 12$ or $y = 6$

___5. What are the solutions to

$$x^2 - 3x - 4 = 0?$$

A $x = 1$ or $x = -4$

B $x = -1$ or $x = 4$

C $x = \frac{3 \pm i\sqrt{7}}{2}$

D $x = \frac{3 \pm \sqrt{7}}{2}$

___6. What are the solutions to

$$4x - 16 = -2x^2?$$

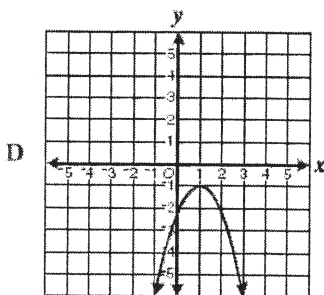
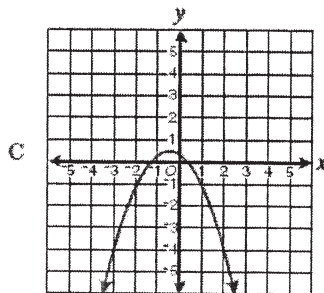
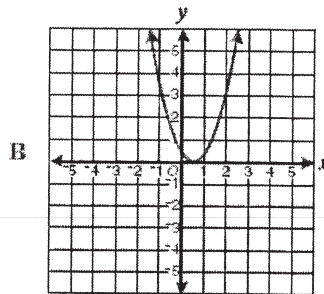
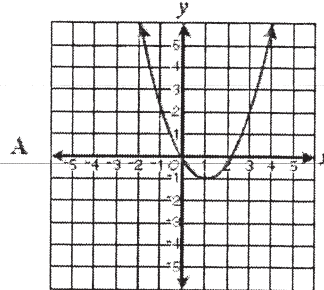
F $x = 4i$ or $x = -2$

G $x = -4$ or $x = 2$

H $x = 4$ or $x = 2i$

J $x = 4$ or $x = 2$

___7 Which graph represents a quadratic equation with *no* real solutions?



**All/T.4 The student will solve, algebraically and graphically,
c) equations containing rational algebraic expressions
Graphing calculators will be used for solving and for confirming the algebraic solutions.**

Notes and Formulas:

To solve a rational equation: Eliminate your denominators

Cross-multiply if possible

Multiply both sides of equation by your Least Common Denominator

Plug it in ! (See what answer satisfies your equation)

Practice Problems:

___1. What is the solution to $\frac{x}{2x+1} = \frac{4}{3}$?

A $x = \frac{-1}{5}$

B $x = 5$

C $x = \frac{-4}{5}$

D $x = \frac{-5}{4}$

___2. What value of q is the solution to the

equation $\frac{7q-9}{6} = \frac{6q+2}{4}$?

F $q = \frac{-11}{8}$

G $q = -6$

H $q = \frac{31}{9}$

J $q = 48$

___3. What is the solution to

$$\frac{3x^2 - 2}{x} = \frac{6x - 2}{x} ?$$

A 6

B 2

C $\sqrt{2}$

D 0

___4. What value of y is the solution to

the equation $\frac{4y-30}{3} + \frac{6y+8}{2} = 9$?

F $y = \frac{28}{5}$

G $y = \frac{45}{13}$

H $y = \frac{8}{5}$

J $y = \frac{23}{24}$

5. TEQ Solve the following equation for x:

$$x + \frac{25}{x} = 10$$

Place your answer in the box.



All/T.4 The student will solve, algebraically and graphically,
d) equations containing radical expressions
Graphing calculators will be used for solving and for confirming the algebraic solutions.

Notes and Formulas:

To solve radical equation: If a squared equation, square root both sides

If a cubed equation, cube root both sides

Plug it in !!!! (see what answer satisfies your equation)

Practice Problems:

___1. 11 What is the solution set for

$$\sqrt{x-4} = 5?$$

A {21}

B {25}

C {29}

D {33}

___2. What is the solution set for

$$\frac{1}{4}\sqrt{9+x} = 1?$$

F {-7, 7}

G {-5, 5}

H {7}

J {5}

___3. What is the solution set for

$$\sqrt{3y+4} = 5?$$

A {3}

B {1}

C $\left\{\frac{1}{3}\right\}$

D $\left\{\frac{1}{9}\right\}$

___4. What is the solution to $\sqrt{x+16} = 3\sqrt{x}$?

F $x = \frac{1}{2}$

G $x = \frac{8}{5}$

H $x = 2$

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___5. What is a solution to $\sqrt[3]{x-3} + 3 = 5$?

- A $x = 2$
- B $x = 3$
- C $x = 7$
- D $x = 11$

___6. The length, s , (in feet) of the skid mark left by an automobile traveling at r miles per hour can be approximated by the relation $r = 2\sqrt{5s}$. If a car is going 80 miles per hour when the brakes are applied, about how many feet long would the skid mark be?

- F 320 ft
- G 410 ft
- H 640 ft
- J 1,280 ft

All/T.5 The student will solve nonlinear systems of equations, including linear-quadratic and quadratic-quadratic, algebraically and graphically. Graphing calculators will be used as a tool to visualize graphs and predict the number of solutions.

Notes and Formulas:

Remember your solution is your point or points of intersection.

If given a graph, look at your choices and approximate where the solutions are (Read your graph)

If given equations: 1. Plug it in !! Plug in choices to see which point satisfies both equations. You are working backwards and checking

2. Use your calculator . Make sure your eqts. are in $y=$ form

Put equation one in y_1

Put second equation in y_2

Use Zoom 6, then adjust your window as needed

Then 2nd Calc #5, put blinker on point, Enter, Enter, Enter

Be sure to check your answer(s).

***If your curves do not intersect at all – There is no solution to your system !

Practice Problems:

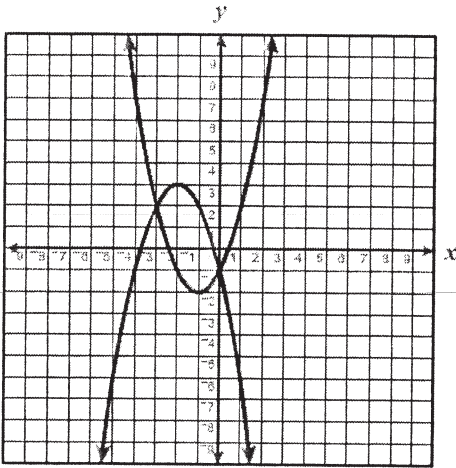
___1. What is the solution set to the

following system of equations?

$$\begin{cases} y + 2x = 2 \\ x^2 + 3y = 22 \end{cases}$$

- A $\{(-8, 18) \text{ and } (2, -2)\}$
- B $\{(-8, 2) \text{ and } (18, -2)\}$
- C $\{(-2, 2) \text{ and } (18, -8)\}$
- D $\{(8, -14) \text{ and } (-2, 6)\}$

2.



This is a portion of the graph of a system of equations. Which is *most* likely the solution set for the system?

- A $\{(0, -1), (-3, 2)\}$
- B $\{(-1, 2), (-2, 3)\}$
- C $\{(1, 2), (2, 7)\}$
- D $\{(-3.7, 0), (0.4, 0)\}$

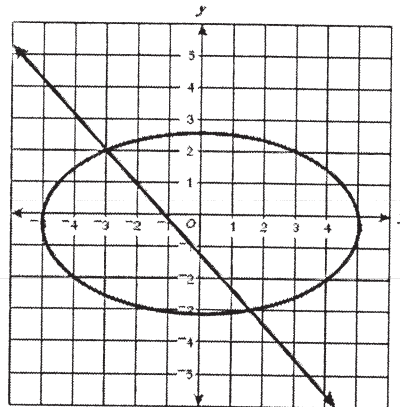
3.

$$\begin{cases} y = x^2 - 2x - 1 \\ y = -x^2 + 4x - 1 \end{cases}$$

Which set of ordered pairs is the solution to the system of equations shown?

- A $\{(0, 3), (-1, 2)\}$
- B $\{(0, -1), (3, 2)\}$
- C $\{(0, -1), (6, 23)\}$
- D $\{(3, 2), (6, -11)\}$

4.



This is a portion of the graph of a system of equations. Which is most likely the solution set for the system?

- F $\{(1.5, 2.5), (3, 2)\}$
- G $\{(-2.5, 1.5), (2, -3)\}$
- H $\{(-2, -3), (2.5, -1.5)\}$
- J $\{(-3, 2), (1.5, -3)\}$

5.

$$\begin{cases} 2y = x^2 - 6x - 9 \\ 2y = -x^2 + 2x + 1 \end{cases}$$

What is the solution set for this system of equations?

- A $\{(5, -7), (-1, -1)\}$
- B $\{(1, 1), (-5, 23)\}$
- C $\{(1, -7), (-5, 23)\}$
- D $\{(2, \frac{1}{2})\}$