White Station High School

Algebra 2 Summer Work

This set of problems contains math concepts from Algebra 1 that are important skills for Algebra 2. WSHS is requiring all students who are enrolled in Algebra 2 for the 2025-2026 school year to turn in a completed packet on Monday, August 4, 2025 which will be graded by your Algebra 2 teacher. This is the first day of the school year. In the following pages, there are 43 required problems with examples to guide you through each concept. After these 43 problems, there are additional problems that are OPTIONAL but will provide further practice for each of the concepts.

This packet does NOT need to be printed. Students are not expected to write on it. ALL problems are to be worked out by hand on notebook paper. Please keep the problems in order by number, writing down the problem numbers as you work through it. When working the problems, students should NOT use a calculator and must show the mathematical steps in order to receive credit.

If you need additional support with the problems, we recommend you utilize the following free websites:

- https://www.khanacademy.org/signup
- https://www.teachertube.com/categories/math
- https://www.algebralab.org/studyaid.aspx
- https://www.purplemath.com/modules.index.htm

Students will benefit most from this work by starting it early. You should try to complete a small set of problems daily. Do NOT do all of it at one time. You are more likely to the retain the information if it is spread out as a review throughout the summer. Algebra 2 is a challenging course, and you will need these skills as you enter the class to be successful.

For students who want a more thorough review of Algebra 2 or advanced look into Algebra 2, please create an account at https://www.khanacademy.org/signup Please enter a “coach” code of 5B9ASA for Algebra 1 and a code of JRSR4T for Algebra 2.

During the school year, students will learn to use the TI NSPIRE CX calculator. If you are planning to purchase a calculator for the 2025-26 school year, note that these are the calculators used in the classrooms and on state testing. There will be class sets of these calculators available specifically for classroom use.

We are excited about working with you in this upcoming school year. We want all students to feel prepared and confident through Algebra 2, and these concepts will set you up for that kind of success.

Sincerely,

Carrye Holland, Principal

WSHS Math Department

Solve each equation for the variable *(Use the following examples to guide you).*

Example 1

Solve: $3\frac{1}{2}p = 1\frac{1}{2}$

$\frac{7}{2}p = \frac{3}{2}$ — Original equation

Rewrite each mixed number as an improper fraction

$\frac{2}{7}\left(\frac{7}{2}p\right) = \left(\frac{3}{2}\right)\frac{2}{7}$ — Multiply each side by the reciprocal of 7/2.

$p = \frac{3}{7}$ — Simplify

Check: $3\frac{1}{2}\left(\frac{3}{7}\right) = 1\frac{1}{2}$ — Substitute solution for variable

$\frac{7}{2}\left(\frac{3}{7}\right) = \frac{3}{2}$ — Rewrite each mixed number as an improper fraction

$\frac{3}{7} = \frac{3}{7}$ — Left Hand Side = Right Hand Side

LHS = RHS correct

Example 2

Solve: $-5n = 60$ — Original equation

$\frac{-5n}{-5} = \frac{60}{-5}$ — Divide both sides by -5 or multiply both sides by -1/5

$n = -12$ — Simplify

Check: $-5(-12) = 60$ — Substitute solution for variable

$60 = 60$ — Left Hand Side = Right Hand Side

LHS = RHS correct

Example 1

Solve: $5y - 8 = 3y + 12$

$5y - 8 - 3y = 3y + 12 - 3y$

$2y - 8 = 12$

$2y - 8 + 8 = 12 + 8$

$2y = 20$

$\frac{2y}{2} = \frac{20}{2}$

$y = 10$

Check: $5y - 8 = 3y + 12$

$5(10) - 8 = 3(10) + 12$

$50 - 8 = 30 + 12$

$42 = 42$

LHS = RHS correct

Example 2

Solve: $-11 - 3y = 8y + 1$

$-11 - 3y + 3y = 8y + 1 + 3y$

$-11 = 11y + 1$

$-11 - 1 = 11y + 1 - 1$

$-12 = 11y$

$\frac{-12}{11} = \frac{11y}{11}$

$\frac{-12}{11} = y$

$-1\frac{1}{11} = y$

Check: $-11 - 3y = 8y + 1$

$-11 - 3\left(\frac{-12}{11}\right) = 8\left(\frac{-12}{11}\right) + 1$

$-11 + \frac{36}{11} = \frac{-96}{11} + 1$

$\frac{-121}{11} + \frac{36}{11} = \frac{-96}{11} + \frac{11}{11}$

$\frac{-85}{11} = \frac{-85}{11}$

LHS = RHS correct

Example 3

Solve: $4(2a - 1) = -10(a - 5)$

$8a - 4 = -10a + 50$

$8a - 4 + 10a = -10a + 50 + 10a$

$18a - 4 = 50$

$18a - 4 + 4 = 50 + 4$

$18a = 54$

$\frac{18a}{18} = \frac{54}{18}$

$a = 3$

Check: $4(2a - 1) = -10(a - 5)$

$4(2(3) - 1) = -10(3 - 5)$

$4(6 - 1) = -10(-2)$

$4(5) = 20$

$20 = 20$

LHS = RHS correct

1. $20 = y - 8$

2. $-17 = b + 4$

3. $\frac{1}{5}p = \frac{3}{5}$

4. $-3t = 51$

5. $5x + 2 = 2x - 10$

6. $4.4s + 6.2s = 8.8s - 1.8$

7. $8 - 5p = 4p - 1$

8. $3(a + 1) - 5 = 3a - 2$

Solve each equation or formula for the indicated variable. *(Use the following examples to guide you).*

Example 1 *Solve $2x - 4y = 8$ for y.*

$$2x - 4y = 8$$
$$2x - 4y - 2x = 8 - 2x$$
$$-4y = 8 - 2x$$
$$\frac{-4y}{-4} = \frac{8 - 2x}{-4}$$
$$y = \frac{8 - 2x}{-4} \text{ or } \frac{2x - 8}{4}$$

Example 2 *Solve $3m - n = km - 8$*

$$3m - n = km - 8$$
$$3m - n - km = km - 8 - km$$
$$3m - n - km = -8$$
$$3m - n - km + n = -8 + n$$
$$3m - km = -8 + n$$
$$m(3 - k) = -8 + n$$
$$\frac{m(3 - k)}{3 - k} = \frac{-8 + n}{3 - k}$$
$$m = \frac{-8 + n}{3 - k}, \text{ or } \frac{n - 8}{3 - k}$$

Since division by 0 is undefined, $3 - k \neq 0$, or $k \neq 3$.

9. Solve $(x + f) + 2 = j$ for x.

10. Solve $7x + 3y = m$ for y.

Write an equation for the function, in function notation. Then complete the table. *(Use the following example to guide you).*

Example: Suppose you purchased a number of packages of blank CDs. If each package contains 3 CDs, you could make a chart to show the relationship between the number of packages of compact disks and the number of disks purchased. Use x for the number of packages and y for the number of compact disks.

Make a table of ordered pairs for several points of the graph.

Number of packages	1	2	3	4	5
Number of CDs	3	6	9	12	15

The difference in the x values is 1, and the difference in the y values is 3. This pattern shows that y is always three times x. This suggests the relation y = 3x. Since the relation is also a function, we can write the equation in functional notation as f(x) = 3x.

11.

x	-2	-1	0	1	2
y	10	7	4		

Write an equation of the line in standard form with the information given. *(Use the following examples to guide you).*

Example 1: Write an equation of a line in standard form whose slope is -4 and whose y-intercept is 3.

$y = mx + b$

$y = -4x + 3$

$+4x \quad +4x$

$4x + y = 3$

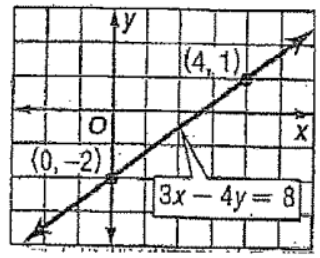
Example 2: Graph $3x - 4y = 8$

$3x - 4y = 8$ Original equation

$-4y = -3x + 8$ Subtract 3x from each side

$\frac{-4y}{-4} = \frac{-3x + 8}{-4}$ Divide each side by -4

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

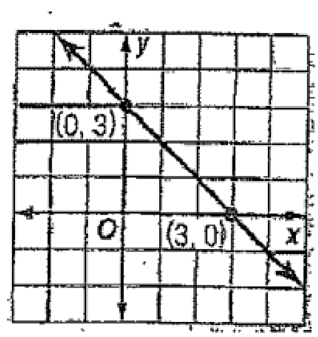


The y-intercept of y = 3/4x - 2 is -2 and the slope is $\frac{3}{4}$. So graph the point (0, -2). From this point, move up 3 units and right 4 units. Draw a line passing through both points.

Standard Form	$Ax + By = C$
Slope-Intercept Form	$y = mx + b$, where m is the given slope and b is the y-intercept
Point-Slope Form	$y - y_1 = m(x - x_1)$, where m is the given slope and (x_1, y_1) is the given point

12. Slope 8 and y-intercept -3

13.



14. Graph the equation $2x - y = -1$

Graph each system of equations. Then determine whether the system has no solution, one solution, or infinitely many solutions. If the system has one solution, tell what it is. *(Use the following examples to guide you).*

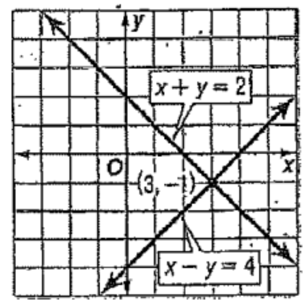
Example: **Graph each system of equations. Then determine whether the system has *no* solution, *one* solution, or *infinitely many* solutions. If the system has one solution, name it.**

a. $x + y = 2$
$x - y = 4$

The graphs intersect. Therefore, there is one solution. The point (3, -1) seems to lie on both lines. Check this estimate by replacing x with 3 and y with -1 in each equation.

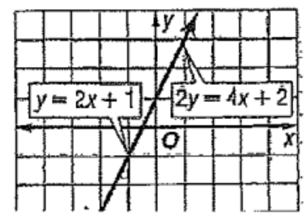
$x + y = 2$
$3 + (-1) = 2$ ✓
$x - y = 4$
$3 - (-1) = 3 + 1$ or 4 ✓

The solution is (3,-1).



b. $y = 2x + 1$
$2y = 4x + 2$

The graphs coincide. Therefore there are infinitely many solutions.



15. $\begin{cases} y = -2 \\ 3x - y = -1 \end{cases}$

16. $\begin{cases} 2x + y = 6 \\ 2x - y = -2 \end{cases}$

Use substitution to solve the system of equations. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions. *(Use the following examples to guide you).*

Example 1: **use substitution to solve they system of equations.**

$y = 2x$
$4x - y = -4$

Substitute 2x for y in the second equation.

$4x - y = -4$	*second equation*
$4x - 2x = -4$	*y = 2x*
$2x = -4$	*combine like terms*
$x = -2$	*Divide each side by 2 and simplify.*

Use y = 2x to find the value of y.

$y = 2x$	*First equation*
$y = 2(-2)$	*x = -2*
$y = -4$	*simplify*

The solution is (-2,-4).

Example 2: **Solve for one variable, then substitute.**

$x + 3y = 7$
$2x - 4y = -6$

Solve the first equation for x since the coefficient of x is 1.

$x + 3y = 7$	*First equation*
$x + 3y - 3y = 7 - 3y$	*Subtract 3y from each side*
$x = 7 - 3y$	*Simplify*

Find the value of y by substituting 7 – 3y for x in the second equation.

$2x - 4y = -6$	*Second equation*
$2(7 - 3y) - 4y = -6$	*x = 7 - 3y*
$14 - 6y - 4y = -6$	*Distributive Property*
$14 - 10y = -6$	*Combine like terms.*
$14 - 10y - 14 = -6 - 14$	*Subtract 14 from each side.*
$-10y = -20$	*Simplify.*
$y = 2$	*Divide each side by -10 and simplify.*

Use y = 2 to find the value of x.

$x = 7 - 3y$
$x = 7 - 3(2)$
$x = 1$

The solution is (1, 2).

17. $\begin{cases} y = 4x \\ 3x - y = 1 \end{cases}$

Use elimination to solve each system of equations. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions. *(Use the following examples to guide you).*

Example 1: Use addition to solve the system of equations
$x - 3y = 7$
$3x + 3y = 9$
Write the equations in column form and add to eliminate y.
$x - 3y = 7$
(+) $3x + 3y = 9$
$4x = 16$
$\frac{4x}{4} = \frac{16}{4}$
$x = 4$

Substitute 4 for x either equation and solve for y.
$4x - 3y = 7$
$4 - 3y - 4 = 7 - 4$
$\frac{-3y}{-3} = \frac{3}{-3}$
$y = -1$
The solution is (4, -1).

Example 2: The sum of two numbers is 70 and their difference is 24. Find the numbers.

Let x represent one number and y represent the other number.
$x + y = 70$
(+) $x - y = 24$
$2x = 94$
$\frac{2x}{2} = \frac{94}{2}$
$x = 47$
Substitute 47 for x in either equation.
$47 + y = 70$
$47 + y - 47 = 70 - 47$
$y = 23$
The numbers are 47 and 23.

18. $\begin{cases} x + y = -4 \\ x - y = 2 \end{cases}$

Find each product. *(Use the following examples to guide you).*

Example 1: Find $-3x^2(4x^2 + 6x - 8)$.
$-3x^2(4x^2 + 6x - 8)$
$= -3x^2(4x^2) + (-3x^2)(6x) - (-3x^2)(8)$
$= -12x^4 + (-18x^3) - (-24x^2)$
$= -12x^4 - 18x^3 + 24x^2$

Example 2: Simplify $-2(4x^2 + 5x) - x(x^2 + 6x)$
$-2(4x^2 + 5x) - x(x^2 + 6x)$
$= -2(4x^2) + (-2)(5x) + (-x)(x^2) + (-x)(6x)$
$= -8x^2 + (-10x) + (-x^3) + (-6x^2)$
$= (-x^3) + [-8x^2 + (-6x^2)] + (-10x)$
$= -x^3 - 14x^2 - 10x$

19. $x(5x + x^2)$

20. $-2g(g^2 - 2g + 2)$

Factor each polynomial. *(Use the following examples to guide you).*

Example 1: Use GCF to factor $12mn + 80m^2$
Find the GCF of $12mn$ and $80m^2$
$12mn = 2 \cdot 2 \cdot 3 \cdot m \cdot n$
$80m^2 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 5\, m \cdot m$
GCF $= 2 \cdot 2 \cdot m$ or $4m$
Write each term as the product of the GCF and its remaining factors.
$12mn + 80m^2 = 4m(3 \cdot n) + 4m(2 \cdot 2 \cdot 5 \cdot m)$
$= 4m(3n) + 4m(20m)$
$= 4m(3n + 20m)$
$12mn + 80m^2 = 4m(3n + 20m)$

Example 2: Factor $6ax + 3ay + 2bx + by$ by grouping.
$6ax + 3ay + 2bx + by$
$= (6ax + 3ay) + (2bx + by)$
$= 3a(2x + y) + b(2x + y)$
$= (3a + b)(2x + y)$

Check using the FOIL method.
$(3a + b)(2x + y)$
$= 3a(2x) + (3a)(y) + (b)(2x) + (b)(y)$
$= 6ax + 3ay + 2bx + by$

21. $24x + 48y$

22. $9x^2 - 3x$

23. $14c^3 - 42c^5 - 49c^4$

Find each product. *(Use the following examples to guide you).*

Example 1: Find $(x + 3)(x - 4)$ $(x+3)(x-4)$ $= x(x-4) + 3(x-4)$ $= (x)(x) + x(-4) + 3(x) + 3(-4)$ $= x^2 - 4x + 3x - 12$ $= x^2 - x - 12$	*Example 2:* Find $(x - 2)(x + 5)$ using FOIL method. $(x-2)(x+5)$ First Outer Inner Last $= (x)(x) + (x)(5) + (-2)(x) + (-2)(5)$ $= x^2 + 5x + (-2x) - 10$ $= x^2 + 3x - 10$

24. $(x + 2)(x + 3)$

25. $(p - 4)(p + 2)$

26. $(3n - 4)(3n - 4)$

Factor each trinomial. *(Use the following examples to guide you).*

Example 1: Factor each trinomial.

a. $x^2 + 7x + 10$

In this trinomial, $b = 7$ and $c = 10$.

Factors of 10	Sum of Factors
1 , 10	11
2 , 5	7

$x^2 + 7x + 10 = (x + 5)(x + 2)$

b. $x^2 - 8x + 7$

In this trinomial, $b = -8$ and $c = 7$.

Notice that $m + n$ is negative and mn is positive, so m and n are both negative.

Since $-7 + (-1) = -8$ and $(-7)(-1) = 7$, $m = -7$ and $n = -1$.

$x^2 - 8x + 7 = (x - 7)(x - 1)$

Example 2: Factor $x^2 + 6x - 16$

In this trinomial, $b = 6$ and $c = -16$. This means $m + n$ is positive and mn is negative. Make a list of the factors of -16, where one factor of each pair is positive.

Factors of -16	Sum of Factors
1, -16	-15
-1 , 16	15
2 , -8	-6
-2, 8	6

Therefore, $m = -2$ and $n = 8$.

$x^2 + 6x - 16 = (x - 2)(x + 8)$

27. $x^2 + 4x + 3$

29. $c^2 - 4c - 12$

31. $x^2 - 2x - 3$

28. $x^2 - x - 6$

30. $x^2 + 6x + 5$

Factor each trinomial, if possible. If the trinomial cannot be factored using integers, write "Prime". *(Use the following examples to guide you).*

Example 1: Factor $2x^2 + 15x + 18$.

In this example, $a = 2$, $b = 15$, and $c = 18$. You need to find two numbers whose sum is 15 and whose product is $2 \cdot 18$ or 36. Make a list of the factors of 36 and look for the pair of factors whose sum is 15.

Factors of 36	Sum of Factors
1, 36	37
2 , 18	20
3 , 12	15

Use the pattern $ax^2 + mx + nx + c$ with $a = 2$, $m = 3$, $n = 12$ and $c = 18$.

$2x^2 + 15x + 18 = 2x^2 + 3x + 12x + 18$

$= (2x^2 + 3x) + (12x + 18)$

$= x(2x + 3) + 6(2x + 3)$

$= (x + 6)(2x + 3)$

Example 2: Factor $3x^2 - 3x - 18$

Note that the GCF of the terms $3x^2$, $3x$, and 18 is 3. First factor out this GCF.

$3x^2 - 3x - 18 = 3(x^2 - x - 6)$.

Now factor $x^2 - x - 6$. Since $a = 1$, find the two factors of -6 whose sum is -1.

Factors of -6	Sum of Factors
1, -6	-5
-1, 6	5
-2 , 3	1
2, -3	-1

Now use the pattern $(x + m)(x + n)$ with $m = 2$ and $n = -3$.

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

The complete factorization is

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

32. $2x^2 - 3x - 2$

33. $6x^2 + 5x - 6$

34. $2a^2 + 5a + 3$

Express the following in simplest radical form.

An expression under a radical sign is in simplest radical form when:

- There is no integer under the radical sign with a perfect square factor.
- There are no fractions under the radical sign.
- There are no radicals in the denominator.

35. $\sqrt{50}$

37. $\sqrt{\frac{6}{27}}$

36. $\sqrt{169}$

Simplify each exponential expression using the properties of exponents in the table below. Answers should be written using positive exponents.

Properties of Exponents

PROPERTY	
Product of Powers	$a^m \bullet a^n = a^{m+n}$
Power of a Power	$(a^m)^n = a^{m \bullet n}$
Power of a Product	$(ab)^m = a^m b^m$
Negative Power	$a^{-n} = \frac{1}{a^n}$ $(a \neq 0)$
Zero Power	$a^0 = 1$ $(a \neq 0)$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}$ $(a \neq 0)$
Power of Quotient	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ $(b \neq 0)$

38. w^{-7}

40. $\left(\frac{4x^9}{12x^4}\right)^3$

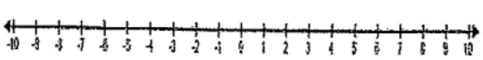
39. $(b^6)^3$

Evaluate the expression for the given value(s).

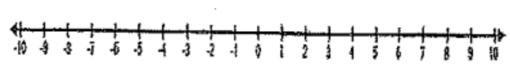
41. $\frac{(x+y)^2}{-y}$ for $x = -12, y = 4$

Solve each linear inequality for the given variable and then graph the solution on the number line.

42. 123) $a+4<-a+2$



43. 126) $3(4-2y) \leq 10$



Additional Practice

Solving Equations

1. $w - \frac{1}{2} = \frac{5}{8}$

2. $\frac{h}{3} = -2$

3. $\frac{1}{8}m = 6$

4. $3h = -42$

5. $-\frac{1}{2}m = 16$

6. $6 - b = 5b + 30$

7. $5y - 2y = 3y + 2$

8. $4n - 8 = 3n + 2$

9. $1.2x + 4.3 = 2.1 - x$

10. $\frac{1}{2}b + 4 = \frac{1}{8}b + 88$

11. $\frac{3}{4}k - 5 = \frac{1}{4}k - 1$

12. $-3(x + 5) = 3(x - 1)$

13. $2(y + 3t) = -t$

Solving Equations for specific variables

14. Solve $ax - b = c$ for x.

15. Solve $15x + 1 = y$ for x.

16. Solve $xy + z = 9$ for y.

17. Solve $x(4 - k) = p$ for k.

18. Solve $xy + xz = 6 + a$ for x.

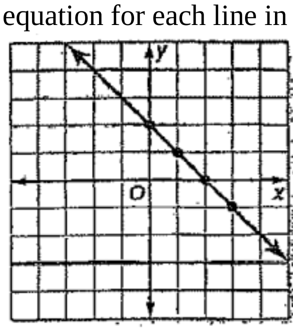
Writing Linear Equations

19. Write an equation for the function in function notation and then complete the table.

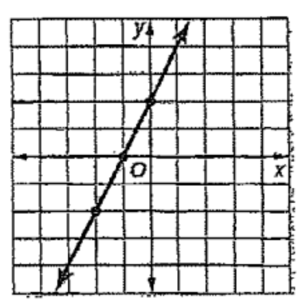
X	-1	0	1	2	3
y	-2	2	6		

20. Write an equation for each line in function notation.

a.



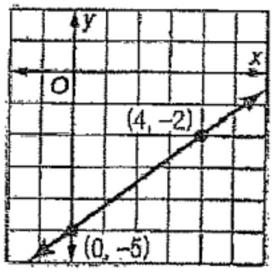
b.

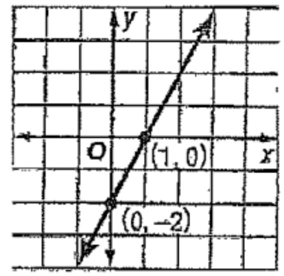


21. Write an equation of the line in standard form given that slope is -2 and the line contains the point (5, 3).

22. Write an equation of the line in standard form given that slope is -1 and the y-intercept is -7.

23. Write an equation of the line in standard form that represents each graph.

a. 

b. 

Graphing Linear Equations and Systems of Linear Equations

24. Graph each equation.

a. $3x + y = 2$

b. $x + y = -1$

25. Graph each system of equations. Determine whether the system has no solution, one solution, or infinitely many solutions. If the system has one solution, tell what it is.

a. $\begin{cases} x = 2 \\ 2x + y = 1 \end{cases}$

c. $\begin{cases} 3x + 2y = 6 \\ 3x + 2y = -4 \end{cases}$

b. $\begin{cases} y = \frac{1}{2}x \\ x + y = 3 \end{cases}$

d. $\begin{cases} 2y = -4x + 4 \\ y = -2x + 2 \end{cases}$

Solving Systems of Linear Equations

26. Solve each system of linear equations using substitution.

a. $\begin{cases} x = 2y \\ y = x - 2 \end{cases}$

b. $\begin{cases} x = 2y - 3 \\ x = 2y + 4 \end{cases}$

27. Solve each system of linear equations using elimination.

a. $\begin{cases} 2m - 3n = 14 \\ m + 3n = -11 \end{cases}$

b. $\begin{cases} 3a - b = -9 \\ -3a - 2b = 0 \end{cases}$

Multiplying Polynomials – find each product.

28. $x(4x^2 + 3x + 2)$

29. $-2xy(2y + 4x^2)$

30. $3x(x^4 + x^3 + x^2)$

31. $-4x(2x^3 - 2x + 3)$

Factoring Polynomials

32. $30mn^2 + m^2n - 6n$

33. $q^4 - 18q^3 + 22q$

34. $4m + 6n - 8mn$

35. $45s^3 - 15s^2$

36. $55p^2 - 11p^4 + 44p^5$

37. $14y^3 - 28y^2 + y$

Find each Product

38. $(x - 4)(x + 1)$

39. $(x - 6)(x - 2)$

40. $(y + 5)(y + 2)$

41. $(2x - 1)(x + 5)$

42. $(8m - 2)(8m + 2)$

43. $(k + 4)(5k - 1)$

Factor each Trinomial (if not possible, write "Prime)

44. $m^2 + 12m + 32$

45. $r^2 - 3r + 2$

46. $x^2 - 4x - 21$

47. $x^2 - 22x + 121$

48. $p^2 - 16p + 64$

49. $9 - 10x + x^2$

50. $a^2 + 8a - 9$

51. $y^2 - 7y - 8$

52. $y^2 + 14y + 20$

53. $m^2 + 9m + 20$

54. $3m^2 - 8m - 3$

55. $16r^2 - 8r + 1$

56. $3x^2 + 2x - 8$

57. $18x^2 - 27x - 5$

58. $18y^2 + 9y - 5$

59. $-4c^2 + 19c - 21$

Simplifying Radicals

60. $\sqrt{24}$

61. $\sqrt{192}$

62. $\sqrt{147}$

63. $\sqrt{\frac{13}{49}}$

64. $\frac{3}{\sqrt{6}}$

Simplify each Expression

65. $g^5 \cdot g^{11}$

66. $(3x^7)(-5x^3)$

67. $\frac{-15x^7}{25x^9}$

68. $\frac{y^{12}}{y^8}$

69. $(-4a^5b^0c)^2$

Evaluate each expression for the given value.

70. $10(t^2 + t)$ for $t = -5$

71. $-5|k + 1|$ for $k = -10$