Name:

ALG 3 & TRIG SUMMER ASSIGNMENT

# Exponents and Radicals

## Integer and Rational Exponents

In general, if $b$ is a real number and $r$ is a positive integer, then $b^r = \underbrace{b \cdot b \cdot b \cdots b}_{r\ factors}$, where $r$ is the __________ and $b$ is the _____________ .

Complete the following properties of exponents.

$(ab)^m =$ _________ $\quad a^{m+n} =$ __________ $\quad a^{mn} =$ ___________ $\quad a^0 =$ ______________

$\frac{1}{a^n} =$ ____________ $\quad \frac{a^m}{a^n} =$ ____________ $\quad \left(\frac{a}{b}\right)^m =$ __________ $\quad a^{1/n} =$ __________

If $a$ is a real number and $n$ is a positive integer such that the principle $n$th root of $a$ exists, then $a^{1/n} = \sqrt[n]{a}$, where $1/n$ is the ____________________________. The numerator of a rational exponent denotes the __________ to which the base is raised, and the denominator denotes the __________ or the _________ to be taken.

**Example 1:** Write the radical expression $\sqrt[4]{w^9}$ in exponential form.

**Example 2:** Simplify the expression $\frac{x^{3/4}}{x^{2/3}}$.

## Radicals and Their Properties

Let $a$ and $b$ be real numbers. If $a = b^2$, then $b$ is the _________________ of $a$. If $a = b^3$, then $b$ is the _________________ of $a$. In $\sqrt[n]{a}$, the positive integer $n$ is the ____________ of the radical, and the number $a$ is the _________________. The radical expression $\sqrt{-36}$ is not a real number because __________________.

## Simplifying Radicals

An expression involving radicals is in **simplest form** when the following conditions are satisfied:

1) ____________________________________________.

2) ____________________________________________.

3) ____________________________________________.

Radical expressions are **like radicals** when ____________________________________________. To add or subtract **like radicals** ____________________________________________.

**Example 1:** Simplify each radical expression.

(a) $-\sqrt{\frac{81}{16}}$ (b) $\sqrt[3]{3}-5\sqrt[3]{3}$ (c) $\sqrt{8}$ (d) $\sqrt{136}$ (E) $\sqrt[3]{m}+\sqrt[3]{9}$

**Rationalizing Denominators and Numerators**

The **conjugate** of the radical expression $a+b\sqrt{m}$ is __________. To rationalize a denominator of the form $a-b\sqrt{m}$ or $a+b\sqrt{m}$, multiply ________________________________________.

**Example 1:** Simplify the radical expression by rationalizing the denominator of the expression

(a) $\frac{4}{\sqrt{8}}$ (b) $\frac{4}{5-\sqrt{8}}$

**Polynomials**

In **standard form**, a polynomial in $x$ is written with ____________________________________________.

Polynomials with one term are called ____________.

Polynomials with two terms are called ____________.

Polynomials with three terms are called ____________.

For polynomials in one variable, the degree of the polynomial is __________________________.

**Example 1:** Write the polynomial $1-6y-5y^3+4y^2$ in standard form and find the degree of the polynomial.

**Operations with Polynomials**

Like terms are terms that have ____________________________________________.

To add or subtract polynomials, ____________________________________________.

To find the product of two polynomials, ____________________________________________.

**Example 1:** (a) Subtract: $(5x^3-9x+4)-(2x^3+5x^2-12x+4)$ (b) Multiply: $(3x-2)(x^2+2x-1)$

**Example 2:** (a) Multiply: $(3x-4)^2$ (b) Multiply: $(x+2)^2$

## Factoring Polynomials

**Factoring** is ______________________________________________. If a polynomial does not factor using integer coefficients, then it is ____________ or ____________.

The simplest type of factoring involves a polynomial that can be written as the product of a monomial and another polynomial.

The technique used here is the Distributive Property in reverse: $ab + ac =$ ____________

**Example 1:** Factor: (a) $3w^3 - 12w^2 + 15w$. Factor: (b) $9x^2 - 18$

**Trinomials with Binomial Factors**

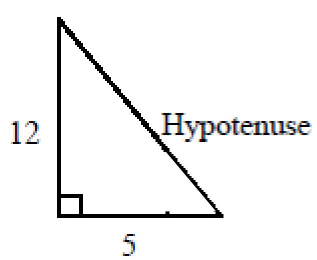
To factor a trinomial of the form $ax^2 + bx + c = ([\,]x + [\,])([\,]x + [\,])$, the goal is to __________________________ ______________________________________________.

**Example 1:** Factor: (a) $x^2 + 3x - 18$ Factor: (b) $9x^2 + 12x + 4$

**Mathematical Models**

The **Pythagorean Theorem** states that for a right triangle with hypotenuse of length $c$ and sides of lengths $a$ and $b$, the mathematical relationship between $a$, $b$, and $c$ is ______________________________.

**Example 1:** In the right triangle below, find the length of the hypotenuse by using the **Pythagorean Theorem**



The **Distance Formula** states that ____________________________________________.

**Example 1:** Find the distance between the points (4, 2) and (5, − 1).

The **Midpoint Formula** gives the midpoint of the segment joining the points $(x_1, y_1)$ and $(x_2, y_2)$ as ____________________________________________.

**Example 1:** Find the midpoint of the line segment with endpoints at (− 8, 2) and (6, − 10). Then find the coordinates of the midpoint.

## Linear Equations in One Variable

**A linear equation in one variable** $x$ is an equation that can be written in the standard form ________________, where $a$ and $b$ are real numbers with $a \neq$ _______. A linear equation has ____________________ solution(s).

**Example 1:** Solve $5(x + 3) = 35$.

## Rational Equations That Lead to Linear Equations

A rational equation is __________________________________________________. To solve a rational equation, __________________________________________________. A rational equation with a single fraction on each side can be cleared of denominators by _____________________, that is, multiplying the left numerator by the right denominator and the right numerator by ___________________________________. Then, solve the linear equation

**Example 1:** Solve: (a) $\frac{5x}{7} = \frac{9}{14}$

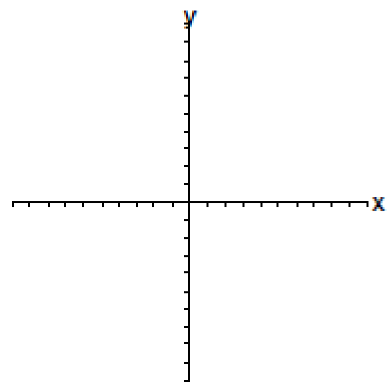
Solve: (b) $\frac{1}{x+1} + \frac{5}{x-1} = \frac{4}{x-1}$

## The Graph of a Linear Equation in Two Variables

The **linear equation in two variables** $y = mx + b$ is called *linear* because__________________________.
A line whose slope is positive __________ from left to right. A line whose slope is negative __________ from left to right. The **slope-intercept form** of the equation of a line is ______________ , where $m$ is the ______________ and the $y$-intercept is (____, ____). A vertical line has an equation of the form ______________.
The equation of a vertical line cannot be written in the form $y = mx + b$ because ________________________
To sketch the graph of a linear equation in two variables use the point-plotting method.

**Example 1:** Complete the table. Then use the resulting solution points to sketch the graph of the equation $y = 3 - 0.5x$.

| $x$ | $-4$ | $-2$ | 0 | 2 | 4 |
|---|---|---|---|---|---|
| $y$ | | | | | |




The slope and the $y$-intercept of a linear equation in two variables can be used to sketch the graph of a linear equation in two variables

Complete the following steps to sketch the graph of a linear equation in two variables using slope and the $y$-intercept

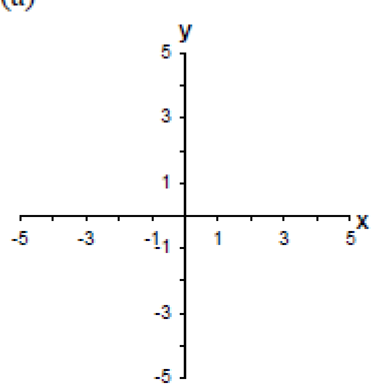
1) ______________________________.

2) ______________________________.

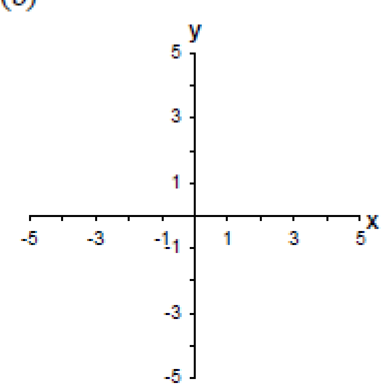
3) ______________________________.

**Example 1:** Sketch the graph of (a) $y = -1$ (b) $x = 3$ and (c) $y = -2/3x - 4$.

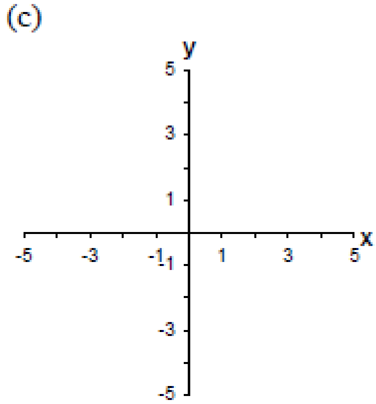
(a)




(b)




(c)



**Finding the Slope of a Line**

The **slope** $m$ of the nonvertical line through $(x_1, y_1)$ and $(x_2, y_2)$ is $m =$ ____________________

**Example 1:** Find the slope of the line through the points (– 2, 5) and (4, – 3).

If a line falls from left to right, it has ____________ slope. If a line is horizontal, it has ______________ slope. If a line is vertical, it has _____________ slope. If a line rises from left to right, it has _____________ slope.

**Parallel and Perpendicular Lines**

The relationship between the slopes of two lines that are parallel is ___________________________________

The relationship between the slopes of two lines that are perpendicular is __________________________________

**Example 1:** (a) A line that is parallel to a line whose slope is 2 has slope ______.

(b) A line that is perpendicular to a line whose slope is 2 has slope ______.

**Writing Linear Equations in Two Variables**

Complete the following steps to write linear equations in two variables

1) ________________________________________.

2) ________________________________________.

**Functions and Function Notation**

The symbol ______________ is **function notation** read as *the value of f at x* or simply *f of x*. Keep in mind that __________ is the name of the function, whereas __________ is the value of the function at $x$.

**Example 1:** If $f(w) = 4w^3 - 5w^2 - 7w + 13$, find $f(-2)$.

**Example 2:** If $f(x) = \sqrt{5x} + 13$, find $f(5)$