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Review

Thou Shalt Not Split a Denominator

1.1 Definition

algebraic expression

1.1 Definition

equation

1.1 Definition

linear equation

Review

Thou Shalt Not Distribute Powers or Radicals

Review

Thou Shalt Not Cancel Terms in a Fraction

1.1 Definition

terms & factors

1.1 Definition

identity

1.1 Definition

polynomial

Thou shalt not distribute powers or radicals.

$$(a \pm b)^n \neq a^n \pm b^n$$
$$\sqrt[n]{a \pm b} \neq \sqrt[n]{a} \pm \sqrt[n]{b}$$
$$\sqrt[n]{a^n \pm b^n} \neq a \pm b$$

Lest I smite thee with a failing grade!

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Thou shalt not cancel terms in a fraction. Only factors may be cancelled, thus thou must factor first!

$$\frac{a+b}{a+c} \neq \frac{1+b}{1+c}$$
$$\frac{a+b}{ac} \neq \frac{1+b}{c}$$

This is an algebraic abomination.

Thou shalt not split a denominator.
(This is distributing a -1 power in disguise.)

$$\frac{1}{a+b} \neq \frac{1}{a} + \frac{1}{b}$$

Do not succumb to such temptation.

A **term** is any algebraic expression participating in addition or subtraction.

A **factor** is any algebraic expression participating in multiplication or division.

An expression obtained by performing additions, subtractions, multiplications, divisions, powers or extractions of roots with one or more real numbers or variables is called an **algebraic expression**.

Think of it as a fragment of a complete mathematical statement, and as such, it can only be simplified but not solved for the variable(s).

An **identity** is a special type of equation which is always true for all values of its variables. It tells you how to rewrite an expression in a different but equivalent way.

For example, the "difference of two squares" formula is an identity.

$$x^2 - a^2 = (x + a)(x - a)$$

An **equation** is a mathematical statement that equates two algebraic expressions. An equation *must* have an equal sign.

We typically solve equations for a particular variable. For example, $3x - 4 = 2$.

A **polynomial** is a special algebraic expression of the form:

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

Where each a_i is a real number. For example

$$x^3 - 3x^2 + 3x - 1$$

is a polynomial.

A **linear equation** is an equation that can be written in the form

$$ax + b = c$$

where $a \neq 0$ and $a, b, c \in \mathbb{R}$.

1.1 Definition

rational equation

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1.1 Definition

domain & range

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1.1 Algorithm

determining the domain

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1.2 Definition

linear inequality

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1.2 Definition

caveat when solving linear inequalities

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1.3 Definition

linear equation in two variables

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1.3 Definition

input variable

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1.3 Definition

output variable

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1.3 Definition

y–intercept

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1.3 Definition

x–intercept

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The **domain** of a function is the set of allowable inputs.

The **range** of a function is the set of values which correspond to at least one value in the domain.

A **linear inequality** is an inequality that can be written in the form

$$ax + b \leq c$$

where $a \neq 0$ and $a, b, c \in \mathbb{R}$.
The inequality symbol may be any one of $<, >, \leq, \geq$.

A **linear equation in two variables** is any equation that can be written in the form

$$y = ax + b$$

where $a, b \in \mathbb{R}$.

The **output variable** or **dependent variable** is the variable that is graphed on the vertical axis in a Cartesian coordinate system. It is often denoted by y.

The point on a line that crosses the x–axis. To find the x–intercept, set the equation of a line equal to zero and solve for x, i.e. solve

$$mx + b = 0$$

An **rational equation** is an equation that contains rational expressions, which are fractions which have polynomials in the numerator and/or denominator.

When solving a rational equation it is important to determine the domain, and exclude any values from the solution set which are not in the domain.

If the domain is unspecified, then it includes all real numbers ($\mathbb{R}$) except

1. Values that make the denominator 0, and
2. Values that result in an even root of a negative number, e.g. $\sqrt{-5}$ or $\sqrt[4]{-2}$.

We solve linear inequalities in the same manner as solving linear equations. We can

1. Add (or subtract) any quantity to both sides of the inequality, and
2. Multiply (or divide) both sides of the inequality by any nonzero value.

However, when multiplying by a negative number, we must flip the inequality.

The **input variable** or **independent variable** is the variable that is graphed on the horizontal axis in a Cartesian coordinate system. It is often denoted by x.

The point on a line that crosses the y–axis. When an equation of a line is written

$$y = mx + b$$

it is the b value.

1.3 Definition

slope of a line

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1.3 Definition

parallel lines

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1.3 Definition

perpendicular lines

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1.3 Definition

slope–intercept form

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1.3 Definition

point–slope form

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1.4 Definition

system of equations

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1.4 Definition

solution set

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1.5 Definition

revenue & cost

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1.5 Definition

profit

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1.5 Definition

break–even point

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Two lines are **parallel** if and only if they have the *same slope.*

The **slope of a line** is found from two points, (x_1, y_1) and (x_2, y_2)

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

Remember it as "rise over run."

The equation of a line is in **slope–intercept form** if it looks like

$$y = mx + b$$

Where m, the slope of the line, and b, the y–intercept of the line are constants.

If a line has slope m, then any line that is **perpendicular** will have slope

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

Where the symbol $m_\perp$ is read "m perp." Remember the perpendicular slope is "the negative reciprocal."

A **system of equations** is a set of two or more equations in two or more unknowns (variables).

The equation of a line is in **point–slope form** if it looks like

$$y - y_1 = m(x - x_1)$$

where m is the slope of the line, and (x_1, y_1) is a point on the line.

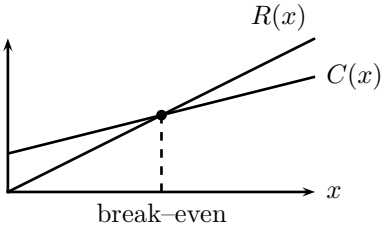
The **solution set** of a system is the set of all points that lie on *all* lines in the system. That is, the set of all pairs (x, y) that satisfy *all* equations simultaneously. The solution set may:

1. be empty (no solution—parallel lines)
2. contain one point (unique solution—crossing lines)
3. contain an infinite number of points (infinitely many solutions—colinear lines)

Revenue is the amount of money earned in a business, usually denoted $R(x)$.

Cost is the amount of money spent to produce and sell a product or service, usually denoted $C(x)$. There are two types: **fixed** and **variable**.

The point where costs and revenue are equal. Also the point where $P(x) = 0$.



Profit is revenue minus costs.

$$P(x) = R(x) - C(x)$$

1.5 Definition

marginal

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1.5 Definition

demand equation

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1.6 Definition

linear inequality in two variables

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Definition

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Definition

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1.5 Definition

supply equation

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1.5 Definition

equilibrium point

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Definition

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Definition

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Definition

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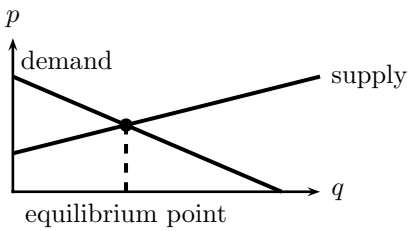
The **supply equation** relates p and q and explains how willing producers are to supply product at various prices.

The point where supply and demand are equal.



Marginal is an adjective that describes how much something changes for one more unit sold.

For example, we could ask for marginal profit, which would indicate how much profit changed for one more unit sold. Marginal profit is the slope of the profit function.

The **demand equation** relates p and q and explains how much of a product consumers will buy at various prices.

An inequality that can be written in the form

$$ax + by \leq c$$

where $a, b, c \in \mathbb{R}$ and the inequality can be any of $<, >, \leq, \geq$.