Algebra 2 Formulas

Fractions

Complex fractions

A complex fraction is a fraction that contains more than one fraction line. In other words, there is at least one fraction nested inside the numerator and/or denominator of the other fraction. As an example,

$$\frac{\frac{a}{x+y} + \frac{m}{y}}{\frac{x}{a+m}}$$

is a complex fraction.

Radicals

Complex numbers

A complex number has a real part and an imaginary part, like

$$4 + 5i$$

Standard form for a complex number means writing the real part first, followed by the imaginary part.

Equations

Direction and inverse variation

If A varies directly as B or if A is directly proportional to B, then

$$A = kB$$

If A varies inversely as B or if A is inversely proportional to B, then

$$A = \frac{k}{B}$$

Distance, rate and time

Distance = Rate × Time

$$D = RT$$

Uniform motion

Knowing that

$$d = r \cdot t$$

where d is distance, r is rate and t is time, if two objects travel the same distance, such that

$$d_1 = d_2$$

then we can also say that

$$r_1 t_1 = r_2 t_2$$

Polynomials and factoring

Special factoring

Difference of squares $\qquad x^2 - y^2 = (x + y)(x - y)$

Difference of cubes $\qquad x^3 - y^3 = (x - y)(x^2 + xy + y^2)$

Sum of cubes $\qquad x^3 + y^3 = (x + y)(x^2 - xy + y^2)$

Zero theorem

If p and q are real numbers and then either $p = 0$ or $q = 0$, or both

$$p \cdot q = 0$$

If $a, b, c, d,...$ are real numbers and then one or more of the factors is 0

$$a \cdot b \cdot c \cdot d \cdot e \cdot f \cdot ... = 0$$

Graphing

Vertical shifts

The graph of a function of F where

$$F(x) = f(x) + k$$

is the graph of f shifted vertically k units.

Horizontal shifts

The graph of a function of F where

$$F(x) = f(x - k)$$

is the graph of f shifted horizontally k units.

Reflections

The graph of the function of F where

$$F(x) = -f(x)$$

is the graph of f reflected about the x-axis.

Distance between two points

The distance d between two coordinate points (x_1, y_1) and (x_2, y_2) is given by

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Logarithms

Laws of logarithms

$$\log_a x = y \iff a^y = x \qquad \log_a(xy) = \log_a x + \log_a y$$

$$\log_a a^x = x \qquad \log_a\left(\frac{x}{y}\right) = \log_a x - \log_a y$$

$$a^{\log_a x} = x \qquad \log_a x^r = r \log_a x$$

Laws of natural logarithms

$$\log_e x = \ln x \qquad \ln(e^x) = x$$

$$\ln x = y \iff e^y = x \qquad e^{\ln x} = x$$

$$\log_a x = \frac{\ln x}{\ln a} \qquad \ln e = 1$$