ALGEBRA CHEAT SHEET

Rules of Zero

$0 * a = 0$

$\frac{0}{a} = 0$

$\frac{a}{0} = undefined$

$a^0 = 1, a \neq 0$

Exponent Properties

$a^{-m} = \frac{1}{a^m}$

1. **Same Base**

   $a^m a^n = a^{m+n}$

   $\frac{a^m}{a^n} = a^{m-n}$

   $(a^m)^n = a^{m*n}$

2. **Different Base**

   $(ab)^m = a^m b^m$

   $\left(\frac{a}{b}\right)^m = \left(\frac{a^m}{b^m}\right)$

   $\left(\frac{a}{b}\right)^{-m} = \left(\frac{b}{a}\right)^m = \left(\frac{b^m}{a^m}\right)$

Properties of Radicals

$\sqrt[m]{a} = a^{\frac{1}{m}}$

$\sqrt[n]{\sqrt[m]{a}} = \sqrt[mn]{a} = a^{\frac{1}{mn}}$

$\sqrt[m]{ab} = \sqrt[m]{a}\sqrt[m]{b} = (ab)^{\frac{1}{m}} = (a)^{\frac{1}{m}}(b)^{\frac{1}{m}}$

$\sqrt[m]{\frac{a}{b}} = \frac{\sqrt[m]{a}}{\sqrt[m]{b}} = \left(\frac{a}{b}\right)^{\frac{1}{m}} = \frac{a^{1/m}}{b^{1/m}}$

Factoring Formulas

$(a+b)^2 = a^2 + 2ab + b^2$

$(a-b)^2 = a^2 - 2ab + b^2$

$(a+b)^3 = a^3 + 3ab^2 + 3ba^2 + b^3$

$(a-b)^3 = a^3 + 3ab^2 - 3ba^2 + b^3$

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

$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$

$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$

Quadratic Formula

Solve the quadratic equation $ax^2 + bx + c = 0$

Then, $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

Binomial Theorem

$(a+b)^1 = a + b$

$(a+b)^2 = a^2 + 2ab + b^2$

$(a+b)^3 = a^3 + 3ab^2 + 3ba^2 + b^3$

$(a+b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

And so on…

Distance Formula

Points: (x_1, y_1) and (x_2, y_2)

Distance between points

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