

Exponent rules

Product, quotient $a^m a^n = a^{m+n}, \quad \frac{a^m}{a^n} = a^{m-n}$

Power $(a^m)^n = a^{mn}, \quad (ab)^n = a^n b^n$

Zero, negative $a^0 = 1, \quad a^{-n} = \frac{1}{a^n}$

Fractional $a^{m/n} = \sqrt[n]{a^m}$

Logarithm rules

Definition $\log_b x = y \iff b^y = x$

Product, quotient $\log(MN) = \log M + \log N, \quad \log \frac{M}{N} = \log M - \log N$

Power $\log M^p = p \log M$

Change of base $\log_b M = \frac{\ln M}{\ln b}$

Values $\log_b 1 = 0, \log_b b = 1, \log 10 = 1, \ln e = 1$

Quadratics and polynomials

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

Discriminant $\Delta = b^2 - 4ac$ ($> 0 : 2, = 0 : 1, < 0 : 0$ real roots)

Vertex $x = -\frac{b}{2a}$

Sum, product of roots $-\frac{b}{a}, \quad \frac{c}{a}$

Factor theorem $p(c) = 0 \iff (x - c)$ is a factor

Factoring identities

Square of sum $(a \pm b)^2 = a^2 \pm 2ab + b^2$

Difference of squares $a^2 - b^2 = (a - b)(a + b)$

Sum, difference of cubes $a^3 \pm b^3 = (a \pm b)(a^2 \mp ab + b^2)$

Lines and functions

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

Forms of a line $y = mx + b, \quad y - y_1 = m(x - x_1)$

Parallel, perpendicular $m_1 = m_2, \quad m_1 m_2 = -1$

Sequences and series

Arithmetic $a_n = a_1 + (n - 1)d, \quad S_n = \frac{n}{2}(a_1 + a_n)$

Geometric $a_n = a_1 r^{n-1}, \quad S_n = a_1 \frac{1-r^n}{1-r}, \quad r \neq 1$

Infinite geometric $S = \frac{a_1}{1-r}, \quad |r| < 1$

Sums $\sum k = \frac{n(n+1)}{2}, \quad \sum k^2 = \frac{n(n+1)(2n+1)}{6}$

Percentages and interest

Percent $\text{percent} = \frac{\text{part}}{\text{whole}} \times 100\%$

Percent change $\frac{\text{new} - \text{old}}{\text{old}} \times 100\%$

Compound interest $A = P \left(1 + \frac{r}{n}\right)^{nt}, \quad A = Pe^{rt}$

Growth, decay $P(t) = P_0 e^{kt}, \quad t_{1/2} = \frac{\ln 2}{|k|}$