

Precalculus Cheat Sheet

Essential formulas and identities

Fractions, Rational Expressions

- $\frac{a}{b} \cdot \frac{c}{d} = \frac{ac}{bd}$
- $\frac{a}{b} \div \frac{c}{d} = \frac{a}{b} \cdot \frac{d}{c}$
- $\frac{a}{b} \pm \frac{c}{d} = \frac{ad \pm bc}{bd}$
- $\frac{a+b}{c} = \frac{a}{c} + \frac{b}{c}$

Powers and Roots

- $a^m \cdot a^n = a^{m+n}, \frac{a^m}{a^n} = a^{m-n}$
- $(a^m)^n = a^{mn}$
- $(ab)^n = a^n b^n, \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$
- $a^0 = 1, a^{-n} = \frac{1}{a^n}$
- $\sqrt[n]{a^m} = a^{m/n}$
- $\sqrt{ab} = \sqrt{a} \cdot \sqrt{b}, \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}$

Binomial Expansions

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

Logarithmic Properties

- $\log_b(xy) = \log_b x + \log_b y$
- $\log_b\left(\frac{x}{y}\right) = \log_b x - \log_b y$
- $\log_b(x^r) = r \log_b x$
- $\log_b b = 1, \log_b 1 = 0$
- Change of base: $\log_b x = \frac{\log_a x}{\log_a b}$
- $\log_b(\sqrt[n]{x}) = \frac{1}{n} \log_b x$