

Prerequisite Packet for AB & BC Calculus<https://www.khanacademy.org/math/get-ready-for-ap-calc>**Formulas and general skills to know:****Linear**Slope-intercept form: $y = mx + b$ Standard form: $Ax + By = C$ Point-slope form: $y - y_1 = m(x - x_1)$ Average rate of change: $\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(b) - f(a)}{b - a}$, where $a \neq b$ **Quadratics and Polynomials**Standard form: $y = ax^2 + bx + c$ Factored form: $y = a(x - p)(x - q)$ Vertex form: $y = a(x - h)^2 + k$ Quadratic formula: $y = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

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

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

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

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

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

General form: $y = a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$

$a_n x^n$	LEFT-HAND BEHAVIOR	
	n is even (same as right)	n is odd (opposite right)
RIGHT-HAND BEHAVIOR or Leading Coefficient Test	$a_n > 0$	always positive
	$a_n < 0$	negative $x < 0$ positive $x > 0$

Exponential and LogarithmicExponential growth: $y = ab^x$ where $b > 1$ Exponential decay: $y = ab^x$ where $b < 1$ Natural growth: $y = e^x$

Exponent rules:

1. $a^m a^n = a^{m+n}$ 2. $(a^m)^n = a^{mn}$ 3. $(ab)^m = a^m b^m$

4. $\frac{a^m}{a^n} = a^{m-n}$, $a \neq 0$ 5. $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, $b \neq 0$ 6. $a^{-m} = \frac{1}{a^m}$, $a \neq 0$

7. $a^{\frac{1}{n}} = \sqrt[n]{a}$ 8. $a^0 = 1$, $a \neq 0$ 9. $a^{\frac{m}{n}} = \sqrt[n]{a^m} = \left(\sqrt[n]{a}\right)^m$

Logarithmic: $y = \log_b x$ where $x = b^y$

Logarithm rules:

$$\log_b(M \cdot N) = \log_b(M) + \log_b(N)$$

$$\log_b\left(\frac{M}{N}\right) = \log_b(M) - \log_b(N)$$

$$\log_b(M^P) = p \cdot \log_b(M)$$

$$\text{Natural log: } y = \log_e x = \ln(x)$$

Trigonometric

Trig functions: $\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}}$, $\cos\theta = \frac{\text{adjacent}}{\text{hypotenuse}}$, $\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$

Reciprocal trig functions: $\csc\theta = \frac{1}{\sin\theta} = \frac{\text{hypotenuse}}{\text{opposite}}$, $\sec\theta = \frac{1}{\cos\theta} = \frac{\text{hypotenuse}}{\text{adjacent}}$, $\cot\theta = \frac{1}{\tan\theta} = \frac{\text{adjacent}}{\text{opposite}}$

Tangent and Cotangent Identities: $\tan\theta = \frac{\sin\theta}{\cos\theta}$, $\cot\theta = \frac{\cos\theta}{\sin\theta}$

Pythagorean Identities: $\sin^2\theta + \cos^2\theta = 1$, $\tan^2\theta + 1 = \sec^2\theta$, $1 + \cot^2\theta = \csc^2\theta$

Double Angle Formulas:

$$\sin(2\theta) = 2\sin\theta\cos\theta, \cos(2\theta) = \cos^2\theta - \sin^2\theta = 2\cos^2\theta - 1 = 1 - 2\sin^2\theta, \tan(2\theta) = \frac{2\tan\theta}{1-\tan^2\theta}$$

$$\text{Half Angle Formulas: } \sin^2\theta = \frac{1-\cos(2\theta)}{2}, \cos^2\theta = \frac{1+\cos(2\theta)}{2}, \tan^2\theta = \frac{1-\cos(2\theta)}{1+\cos(2\theta)}$$

Sum and Difference Formulas: $\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$,

$\cos(\alpha \pm \beta) = \cos\alpha\cos\beta \pm \sin\alpha\sin\beta$

Geometry

Area for a rectangle: $A = l \cdot w$

Area for a square: $A = s^2$

Area for a triangle: $A = \frac{1}{2}bh$

Area for a trapezoid: $A = h\left(\frac{b_1+b_2}{2}\right)$

Surface Area of prisms: $SA = \text{sum of } A_{\text{faces}}$

General Skills

- Find y-intercepts for all types of functions
- Find x-intercepts for all types of functions
- Determine horizontal asymptotes for all types of functions
- Determine vertical asymptotes for all types of functions
- End behavior of polynomial functions
- Determine values/intervals of discontinuity for rational and piecewise functions
- Factoring quadratics and other polynomials using completing the square, guess and check, grouping, etc.
- Identify domain and range for all types of functions
- Understand and memorize the Unit circle
- Function notation and composition of functions

- Partial fractions decomposition (BC only)