Mathematics 30-1 Formula Sheet

For $ax^2 + bx + c = 0$,

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

Relations and Functions

Graphing Calculator Window Format

x: $[x_{\min}, x_{\max}, x_{\text{scl}}]$
y: $[y_{\min}, y_{\max}, y_{\text{scl}}]$

Laws of Logarithms

$$\log_b(M \times N) = \log_b M + \log_b N$$
$$\log_b\left(\frac{M}{N}\right) = \log_b M - \log_b N$$
$$\log_b(M^n) = n \log_b M$$
$$\log_b c = \frac{\log_a c}{\log_a b}$$

Growth/Decay Formula

$$y = ab^{\frac{t}{p}}$$

General Form of a Transformed Function

$$y = af[b(x - h)] + k$$

Permutations, Combinations, and the Binomial Theorem

$n! = n(n-1)(n-2)\ldots3 \times 2 \times 1$,
where $n \in \mathrm{N}$ and $0! = 1$

$${}_nP_r = \frac{n!}{(n-r)!}$$

$${}_nC_r = \frac{n!}{(n-r)!r!} \qquad {}_nC_r = \binom{n}{r}$$

In the expansion of $(x + y)^n$,
the general term is $t_{k+1} = {}_nC_k x^{n-k} y^k$.

Trigonometry

$$\theta = \frac{a}{r}$$

$$\tan\theta = \frac{\sin\theta}{\cos\theta} \qquad \cot\theta = \frac{\cos\theta}{\sin\theta}$$

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sec\theta = \frac{1}{\cos\theta}$$

$$\cot\theta = \frac{1}{\tan\theta}$$

$$\sin^2\theta + \cos^2\theta = 1$$
$$1 + \tan^2\theta = \sec^2\theta$$
$$1 + \cot^2\theta = \csc^2\theta$$

$$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$$
$$\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$$
$$\cos(\alpha + \beta) = \cos\alpha\cos\beta - \sin\alpha\sin\beta$$
$$\cos(\alpha - \beta) = \cos\alpha\cos\beta + \sin\alpha\sin\beta$$

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta}$$
$$\tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$$
$$\sin(2\alpha) = 2\sin\alpha\cos\alpha$$
$$\cos(2\alpha) = \cos^2\alpha - \sin^2\alpha$$
$$\cos(2\alpha) = 2\cos^2\alpha - 1$$
$$\cos(2\alpha) = 1 - 2\sin^2\alpha$$
$$\tan(2\alpha) = \frac{2\tan\alpha}{1 - \tan^2\alpha}$$

$$y = a\sin[b(x - c)] + d$$
$$y = a\cos[b(x - c)] + d$$