

## Algebra 2/Trigonometry Reference Sheet

### Area of a Triangle

$$K = \frac{1}{2} ab \sin C$$

### Functions of the Sum of Two Angles

$$\begin{aligned} \sin(A+B) &= \sin A \cos B + \cos A \sin B \\ \cos(A+B) &= \cos A \cos B - \sin A \sin B \\ \tan(A+B) &= \frac{\tan A + \tan B}{1 - \tan A \tan B} \end{aligned}$$

### Functions of the Difference of Two Angles

$$\begin{aligned} \sin(A-B) &= \sin A \cos B - \cos A \sin B \\ \cos(A-B) &= \cos A \cos B + \sin A \sin B \\ \tan(A-B) &= \frac{\tan A - \tan B}{1 + \tan A \tan B} \end{aligned}$$

### Law of Sines

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

### Sum of a Finite Arithmetic Series

$$S_n = \frac{n(a_1 + a_n)}{2}$$

### Binomial Theorem

$$(a+b)^n = {}_n C_0 a^n b^0 + {}_n C_1 a^{n-1} b^1 + {}_n C_2 a^{n-2} b^2 + \dots + {}_n C_n a^0 b^n$$

$$(a+b)^n = \sum_{r=0}^n {}_n C_r a^{n-r} b^r$$

### Law of Cosines

$$a^2 = b^2 + c^2 - 2bc \cos A$$

### Functions of the Double Angle

$$\begin{aligned} \sin 2A &= 2 \sin A \cos A \\ \cos 2A &= \cos^2 A - \sin^2 A \\ \cos 2A &= 2 \cos^2 A - 1 \\ \cos 2A &= 1 - 2 \sin^2 A \\ \tan 2A &= \frac{2 \tan A}{1 - \tan^2 A} \end{aligned}$$

### Functions of the Half Angle

$$\begin{aligned} \sin \frac{1}{2} A &= \pm \sqrt{\frac{1 - \cos A}{2}} \\ \cos \frac{1}{2} A &= \pm \sqrt{\frac{1 + \cos A}{2}} \\ \tan \frac{1}{2} A &= \pm \sqrt{\frac{1 - \cos A}{1 + \cos A}} \end{aligned}$$

### Sum of a Finite Geometric Series

$$S_n = \frac{a_1(1-r^n)}{1-r}$$

