Math Cheat Sheet Identities

Identity / Formula	Mathematical Expression
Pythagorean Identity	$\sin^2\theta + \cos^2\theta = 1$
Sum and Difference Formulas	$\sin(\theta \pm \phi) = \sin\theta\cos\phi \pm \cos\theta\sin\phi$
	$\cos(\theta \pm \phi) = \cos\theta\cos\phi \mp \sin\theta\sin\phi$
Double Angle Formulas	$\sin(2\theta) = 2\sin\theta\cos\theta$
	$\cos(2\theta) = \cos^2\theta - \sin^2\theta$
Half Angle Formulas	$\sin^2\left(\frac{\theta}{2}\right) = \frac{1-\cos\theta}{2}$
	$\cos^2\left(\frac{\theta}{2}\right) = \frac{1+\cos\theta}{2}$
Tangent in terms of Sine and Cosine	$\tan\theta = \frac{\sin\theta}{\cos\theta}$
Cotangent in terms of Sine and Cosine	$\cot\theta = \frac{\cos\theta}{\sin\theta}$
Secant in terms of Cosine	$\sec\theta = \frac{1}{\cos\theta}$
Cosecant in terms of Sine	$\csc\theta = \frac{1}{\sin\theta}$
Sum-to-Product Formulas	$\sin\theta + \sin\phi = 2\sin\left(\frac{\theta+\phi}{2}\right)\cos\left(\frac{\theta-\phi}{2}\right)$
	$\cos\theta + \cos\phi = 2\cos\left(\frac{\theta+\phi}{2}\right)\cos\left(\frac{\theta-\phi}{2}\right)$
Product-to-Sum Formulas	$\sin\theta\sin\phi = \frac{1}{2}[\cos(\theta-\phi) - \cos(\theta+\phi)]$
	$\cos\theta\cos\phi = \frac{1}{2}[\cos(\theta-\phi) + \cos(\theta+\phi)]$
Square of a Sum	$(a+b)^2 = a^2 + 2ab + b^2$
Square of a Difference	$(a-b)^2 = a^2 - 2ab + b^2$
Product of Sum and Difference	$(a+b)(a-b) = a^2 - b^2$
Cube of a Sum	$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$
Cube of a Difference	$(a-b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

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