Precalculus Honors Formula Sheet

Opposite angle relationships

$\sin(-\theta) = -\sin\theta$ $\cos(-\theta) = \cos\theta$ $\tan(-\theta) = -\tan\theta$

$\csc(-\theta) = -\csc\theta$ $\sec(-\theta) = \sec\theta$ $\cot(-\theta) = -\cot\theta$

Co-function relationships

$\sin(\theta) = \cos(90^\circ - \theta)$ $\cos(\theta) = \sin(90^\circ - \theta)$ $\tan(\theta) = \cot(90^\circ - \theta)$

$\csc(\theta) = \sec(90^\circ - \theta)$ $\sec(\theta) = \csc(90^\circ - \theta)$ $\cot(\theta) = \tan(90^\circ - \theta)$

Pythagorean relationships

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

Sum, Difference & Double Angle Formulas

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

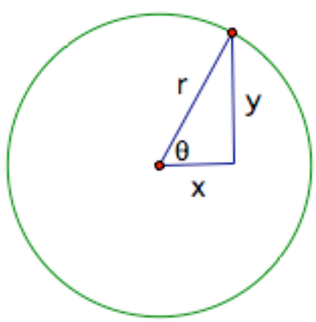
$\sin(\alpha + \beta) = \sin\alpha\cos\beta + \cos\alpha\sin\beta$ $\sin(\alpha - \beta) = \sin\alpha\cos\beta - \cos\alpha\sin\beta$

$$\tan(\alpha + \beta) = \frac{\tan\alpha + \tan\beta}{1 - \tan\alpha\tan\beta} \qquad \tan(\alpha - \beta) = \frac{\tan\alpha - \tan\beta}{1 + \tan\alpha\tan\beta}$$

$$\sin 2\alpha = 2\sin\alpha\cos\alpha \qquad \tan 2\alpha = \frac{2\tan\alpha}{1 - \tan^2\alpha}$$

$$\cos 2\alpha = \cos^2\alpha - \sin^2\alpha = 2\cos^2\alpha - 1 = 1 - 2\sin^2\alpha$$

Polar coordinates & graphs



$z_1 z_2 = (r cis\alpha)(s cis\beta) = rs cis(\alpha + \beta)$

If $z = r cis\theta$ then $z^n = r^n cis n\theta$

$\sqrt[n]{z} = z^{\frac{1}{n}} = r^{\frac{1}{n}} cis\left(\frac{\theta}{n} + \frac{k \cdot 360^\circ}{n}\right)$ for k=0, 1, 2, …, n-1

Exponents & logs

$A = P(1+\frac{r}{n})^{nt}$

$A = Pe^{rt}$

$\log_b MN = \log_b M + \log_b N$

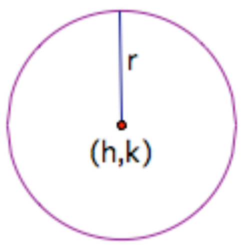
$\log_b \frac{M}{N} = \log_b M - \log_b N$

$\log_b M^k = k\log_b M$

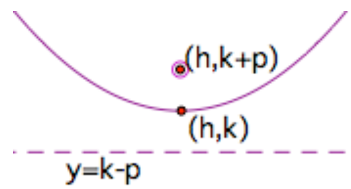
$\log_b c = \frac{\log_a c}{\log_a b}$

Conic sections

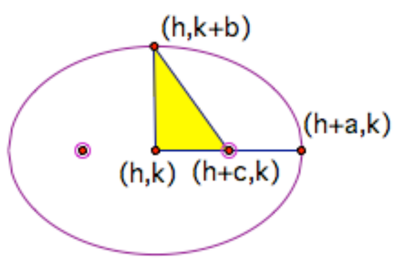
$(x-h)^2 + (y-k)^2 = r^2$



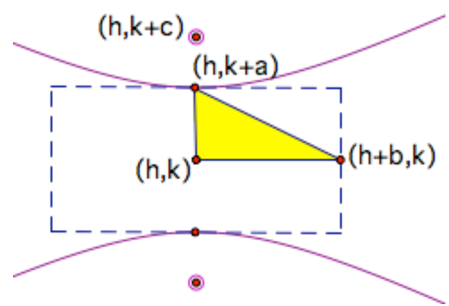
$y = \frac{1}{4p}(x-h)^2 + k$



$\frac{(x-h)^2}{a^2} + \frac{(y-k)^2}{b^2} = 1$



$\frac{(y-k)^2}{a^2} - \frac{(x-h)^2}{b^2} = 1$



Probability

$(a+b)^n = {}_nC_0 a^n b^0 + {}_nC_1 a^{n-1} b^1 + {}_nC_2 a^{n-2} b^2 + \ldots + {}_nC_n a^{n-n} b^n$

$P(k \text{ successes out of } n \text{ trials}) = {}_nC_k p^k (1-p)^{n-k}$ where $P(success) = p$

Sequences and series

$t_n = t_1 + (n-1)d$ $\quad S_n = \frac{n(t_1 + t_n)}{2}$ $\quad \begin{Bmatrix} t_n = t_{n-1} + d \\ t_1 = k \end{Bmatrix}$

$t_n = t_1(r)^{n-1}$ $\quad S_n = \frac{t_1(1-r^n)}{1-r}$ $\quad \begin{Bmatrix} t_n = t_{n-1} \bullet r \\ t_1 = k \end{Bmatrix}$

$S = \frac{t_1}{1-r}$ if $|r| < 1$