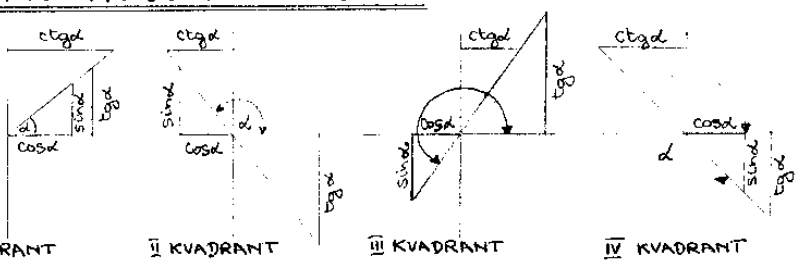
RAVNINSKA TRIGONOMETRIJA

$\sin\sphericalangle = \frac{\text{nasuprotna kateta}}{\text{hipotenuza}}$

$\cos\sphericalangle = \frac{\text{priležeća kateta}}{\text{hipotenuza}}$

$\operatorname{tg}\sphericalangle = \frac{\text{nasuprotna kateta}}{\text{priležeća kateta}}$

$\operatorname{ctg}\sphericalangle = \frac{\text{priležeća kateta}}{\text{nasuprotna kateta}}$



I $\sin^2\alpha+\cos^2\alpha=1$
$\sin^2\alpha=1-\cos^2\alpha$
$\cos^2\alpha=1-\sin^2\alpha$
$\sin\alpha=\pm\sqrt{1-\cos^2\alpha}$
$\cos\alpha=\pm\sqrt{1-\sin^2\alpha}$

II $\operatorname{tg}\alpha=\frac{\sin\alpha}{\cos\alpha}$
$\operatorname{ctg}\alpha=\frac{\cos\alpha}{\sin\alpha}$
$\operatorname{tg}\alpha\cdot\operatorname{ctg}\alpha=1$

III $\operatorname{tg}\alpha=\frac{1}{\operatorname{ctg}\alpha}$
$\operatorname{ctg}\alpha=\frac{1}{\operatorname{tg}\alpha}$
$1+\operatorname{ctg}^2\alpha=\frac{1}{\sin^2\alpha}$
$1+\operatorname{tg}^2\alpha=\frac{1}{\cos^2\alpha}$

IV $\sec\alpha=\frac{1}{\cos\alpha}$
$\operatorname{cosec}\alpha=\frac{1}{\sin\alpha}$
$1+\operatorname{ctg}^2\alpha=\operatorname{cosec}^2\alpha$
$1+\operatorname{tg}^2\alpha=\sec^2\alpha$

V $\sin2\alpha=2\sin\alpha\cos\alpha$
$\sin\alpha=2\sin\frac{\alpha}{2}\cos\frac{\alpha}{2}$
$\sin\frac{\alpha}{2}=2\sin\frac{\alpha}{4}\cos\frac{\alpha}{4}$
$\sin4\alpha=2\sin2\alpha\cos2\alpha$

VI $\cos2\alpha=\cos^2\alpha-\sin^2\alpha$
$\cos\alpha=\cos^2\frac{\alpha}{2}-\sin^2\frac{\alpha}{2}$
$\cos\frac{\alpha}{2}=\cos^2\frac{\alpha}{4}-\sin^2\frac{\alpha}{4}$
$\cos4\alpha=\cos^22\alpha-\sin^22\alpha$

VII $\operatorname{tg}2\alpha=\frac{2\operatorname{tg}\alpha}{1-\operatorname{tg}^2\alpha}$
$\operatorname{tg}\alpha=\frac{2\operatorname{tg}\frac{\alpha}{2}}{1-\operatorname{tg}^2\frac{\alpha}{2}}$
$\operatorname{tg}4\alpha=\frac{2\operatorname{tg}2\alpha}{1-\operatorname{tg}^22\alpha}$

VIII $\operatorname{ctg}2\alpha=\frac{\operatorname{ctg}^2\alpha-1}{2\operatorname{ctg}\alpha}$
$\operatorname{ctg}\alpha=\frac{\operatorname{ctg}^2\frac{\alpha}{2}-1}{2\operatorname{ctg}\frac{\alpha}{2}}$
$\operatorname{ctg}4\alpha=\frac{\operatorname{ctg}^22\alpha-1}{2\operatorname{ctg}2\alpha}$

IX $1+\cos\alpha=2\cos^2\frac{\alpha}{2}$
$1+\cos2\alpha=2\cos^2\alpha$
$1+\cos4\alpha=2\cos^22\alpha$
$1+\cos\frac{\alpha}{2}=2\cos^2\frac{\alpha}{4}$

X $1-\cos\alpha=2\sin^2\frac{\alpha}{2}$
$1-\cos2\alpha=2\sin^2\alpha$
$1-\cos4\alpha=2\sin^22\alpha$
$1-\cos\frac{\alpha}{2}=2\sin^2\frac{\alpha}{4}$

XI $\sin^2\alpha=\frac{1}{2}(1-\cos2\alpha)$
$\sin^2\alpha=\frac{1}{1+\operatorname{ctg}^2\alpha}$
$\cos^2\alpha=\frac{1}{2}(1+\cos2\alpha)$
$\cos^2\alpha=\frac{1}{1+\operatorname{tg}^2\alpha}$

XII $\sin^3\alpha=\frac{1}{4}(3\sin\alpha-\sin3\alpha)$
$\cos^3\alpha=\frac{1}{4}(3\cos\alpha+\cos3\alpha)$
$\sin^4\alpha=\frac{1}{8}(\cos4\alpha-4\cos2\alpha+3)$
$\cos^4\alpha=\frac{1}{8}(\cos4\alpha+4\cos2\alpha+3)$

XIII $\operatorname{tg}^2\alpha=\frac{1-\cos2\alpha}{1+\cos2\alpha}$
$\operatorname{tg}^2\frac{\alpha}{2}=\frac{1-\cos\alpha}{1+\cos\alpha}$
$\operatorname{tg}^2\alpha=\frac{1}{\cos^2\alpha}-1$

XIV $\operatorname{ctg}^2\alpha=\frac{1+\cos2\alpha}{1-\cos2\alpha}$
$\operatorname{ctg}^2\frac{\alpha}{2}=\frac{1+\cos\alpha}{1-\cos\alpha}$
$\operatorname{ctg}^2\alpha=\frac{1}{\sin^2\alpha}-1$

XV $\cos2\alpha=2\cos^2\alpha-1$
$\cos\alpha=2\cos^2\frac{\alpha}{2}-1$
$\cos2\alpha=1-2\sin^2\alpha$
$\cos\alpha=1-2\sin^2\frac{\alpha}{2}$

XVI $\sin3\alpha=3\sin\alpha-4\sin^3\alpha$
$\cos3\alpha=4\cos^3\alpha-3\cos\alpha$
$\sin4\alpha=4\sin\alpha(2\cos^3\alpha-\cos\alpha)$
$\cos4\alpha=8\cos^4\alpha-8\cos^2\alpha+1$

XVII $\operatorname{tg}3\alpha=\frac{3\operatorname{tg}\alpha-\operatorname{tg}^3\alpha}{1-3\operatorname{tg}^2\alpha}$
$\operatorname{ctg}3\alpha=\frac{\operatorname{ctg}^3\alpha-3\operatorname{ctg}\alpha}{3\operatorname{ctg}^2\alpha-1}$

XVIII $\operatorname{tg}4\alpha=\frac{4\operatorname{tg}\alpha-4\operatorname{tg}^3\alpha}{1-6\operatorname{tg}^2\alpha+\operatorname{tg}^4\alpha}$
$\operatorname{ctg}4\alpha=\frac{\operatorname{ctg}^4\alpha-6\operatorname{ctg}^2\alpha-1}{4\operatorname{ctg}^3\alpha-4\operatorname{ctg}\alpha}$

XIX $\sin\alpha=\pm\sqrt{\frac{1-\cos2\alpha}{2}}$
$\cos\alpha=\pm\sqrt{\frac{1+\cos2\alpha}{2}}$

XX $\operatorname{tg}\alpha=\pm\sqrt{\frac{1-\cos2\alpha}{1+\cos2\alpha}}$
$\operatorname{ctg}\alpha=\pm\sqrt{\frac{1+\cos2\alpha}{1-\cos2\alpha}}$

XXI $\sin5\alpha=\sin\alpha(16\cos^4\alpha-12\cos^2\alpha+1)$
$\cos5\alpha=\cos\alpha(16\cos^4\alpha-20\cos^2\alpha+5)$
$\sin6\alpha=\sin\alpha(32\cos^5\alpha-32\cos^3\alpha+6\cos\alpha)$
$\cos6\alpha=32\cos^6\alpha-48\cos^4\alpha+18\cos^2\alpha-1$

XXII $\sin^5\alpha=\frac{1}{16}(10\sin\alpha-5\sin3\alpha+\sin5\alpha)$
$\cos^5\alpha=\frac{1}{16}(10\cos\alpha+5\cos3\alpha+\cos5\alpha)$
$\sin^6\alpha=\frac{1}{32}(10-15\cos2\alpha+6\cos4\alpha-\cos6\alpha)$
$\cos^6\alpha=\frac{1}{32}(10+15\cos2\alpha+6\cos4\alpha+\cos6\alpha)$

XXIII $\operatorname{tg}\frac{\alpha}{2}=\frac{1-\cos\alpha}{\sin\alpha}=\frac{\sin\alpha}{1+\cos\alpha}$
$\operatorname{ctg}\frac{\alpha}{2}=\frac{1+\cos\alpha}{\sin\alpha}=\frac{\sin\alpha}{1-\cos\alpha}$

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

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

XXVI $\operatorname{tg}(\alpha+\beta)=\frac{\operatorname{tg}\alpha+\operatorname{tg}\beta}{1-\operatorname{tg}\alpha\operatorname{tg}\beta}$
$\operatorname{ctg}(\alpha+\beta)=\frac{\operatorname{ctg}\alpha\operatorname{ctg}\beta-1}{\operatorname{ctg}\beta+\operatorname{ctg}\alpha}$

XXVII $\sin\alpha\sin\beta=\frac{1}{2}[\cos(\alpha-\beta)-\cos(\alpha+\beta)]$
$\cos\alpha\cos\beta=\frac{1}{2}[\cos(\alpha-\beta)+\cos(\alpha+\beta)]$

XXVIII $\sin\alpha\cos\beta=\frac{1}{2}[\sin(\alpha+\beta)+\sin(\alpha-\beta)]$
$\cos\alpha\sin\beta=\frac{1}{2}[\sin(\alpha+\beta)-\sin(\alpha-\beta)]$

XXIX $\operatorname{tg}(\alpha-\beta)=\frac{\operatorname{tg}\alpha-\operatorname{tg}\beta}{1+\operatorname{tg}\alpha\operatorname{tg}\beta}$
$\operatorname{ctg}(\alpha-\beta)=\frac{\operatorname{ctg}\alpha\operatorname{ctg}\beta+1}{\operatorname{ctg}\beta-\operatorname{ctg}\alpha}$

XXX $\sin\alpha+\sin\beta=2\sin\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}$
$\sin\alpha-\sin\beta=2\cos\frac{\alpha+\beta}{2}\sin\frac{\alpha-\beta}{2}$

XXXI $\cos\alpha+\cos\beta=2\cos\frac{\alpha+\beta}{2}\cos\frac{\alpha-\beta}{2}$
$\cos\alpha-\cos\beta=-2\sin\frac{\alpha+\beta}{2}\sin\frac{\alpha-\beta}{2}$

XXXII $\operatorname{tg}\alpha+\operatorname{tg}\beta=\frac{\sin(\alpha+\beta)}{\cos\alpha\cos\beta}$
$\operatorname{tg}\alpha-\operatorname{tg}\beta=\frac{\sin(\alpha-\beta)}{\cos\alpha\cos\beta}$
$\operatorname{ctg}\alpha+\operatorname{ctg}\beta=\frac{\sin(\alpha+\beta)}{\sin\alpha\sin\beta}$
$\operatorname{ctg}\alpha-\operatorname{ctg}\beta=-\frac{\sin(\alpha-\beta)}{\sin\alpha\sin\beta}$
$\operatorname{tg}\alpha+\operatorname{ctg}\beta=\frac{\cos(\alpha-\beta)}{\cos\alpha\sin\beta}$
$\operatorname{ctg}\alpha-\operatorname{tg}\beta=\frac{\cos(\alpha-\beta)}{\sin\alpha\cos\beta}$

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