Le formule goniometriche

Ricordiamo che ...

Formule di sottrazione

$\text{sen}(\alpha - \beta) = \text{sen}\,\alpha\,\cos\beta - \cos\alpha\,\text{sen}\,\beta$
$\cos(\alpha - \beta) = \cos\alpha\,\cos\beta + \text{sen}\,\alpha\,\text{sen}\,\beta$
$\text{tg}(\alpha - \beta) = \text{tg}\,\alpha - \text{tg}\,\beta \,/\, 1 + \text{tg}\,\alpha\,\text{tg}\,\beta$
$\text{cotg}(\alpha - \beta) = -(1 + \text{cotg}\,\alpha\,\text{cotg}\,\beta \,/\, \text{cotg}\,\alpha - \text{cotg}\,\beta)$

Formule di addizione

$\text{sen}(\alpha + \beta) = \text{sen}\,\alpha\,\cos\beta + \cos\alpha\,\text{sen}\,\beta$
$\cos(\alpha + \beta) = \cos\alpha\,\cos\beta - \text{sen}\,\alpha\,\text{sen}\,\beta$
$\text{tg}(\alpha + \beta) = \text{tg}\,\alpha + \text{tg}\,\beta \,/\, 1 - \text{tg}\,\alpha\,\text{tg}\,\beta$
$\text{cotg}(\alpha + \beta) = \text{cotg}\,\alpha\,\text{cotg}\,\beta - 1 \,/\, \text{cotg}\,\alpha + \text{cotg}\,\beta$

Formule di Duplicazione

$\text{sen}\,2\alpha = 2\,\text{sen}\,\alpha\,\cos\alpha$
$\cos 2\alpha = \cos^2\alpha - \text{sen}^2\alpha = 1 - 2\text{sen}^2\alpha = 2\cos^2\alpha - 1$
$\text{tg}\,2\alpha = 2\,\text{tg}\,\alpha \,/\, 1 - \text{tg}^2\alpha$
$\text{cotg}\,2\alpha = \text{cotg}^2\,\alpha - 1 \,/\, 2\,\text{cotg}\,\alpha$

Formule di Moltiplicazione

$\text{sen}\,3\alpha = 3\,\text{sen}\,\alpha - 4\,\text{sen}^3\,\alpha$
$\cos 3\alpha = 4\cos^3\alpha - 3\cos\alpha$
$\text{tg}\,3\alpha = \text{tg}\,\alpha\,(3 - \text{tg}^2\alpha \,/\, 1 - 3\,\text{tg}^2\,\alpha)$

Formule di Bisezione

$\text{sen}\,\alpha/2 = \pm\sqrt{1-\cos\alpha \,/\, 2}$
$\cos\alpha/2 = \pm\sqrt{1+\cos\alpha \,/\, 2}$
$\text{tg}\,\alpha/2 = \pm\sqrt{1-\cos\alpha \,/\, 1+\cos\alpha}$

$\text{cotg}\ \alpha/2 = \pm\sqrt{1+\cos\alpha\ /\ 1-\cos\alpha}$

Formule di prostaferesi

$\text{sen}\ p \pm \text{sen}\ q = 2\text{sen}((p \pm q)/2)\cos((p \pm q)/2)$
$\cos p + \cos q = 2\cos((p + q)/2)\cos((p - q)/2)$ $\cos p - \cos q = -2\cos((p \pm q)/2)\cos((p - q)/2)$
$\text{tg}\ p \pm \text{tg}\ q = \text{sen}(p \pm q) / \cos p \cos q$
$\text{cotg}\ p \pm \text{cotg}\ q = \text{sen}(p \pm \beta) / \text{sen}\ p\ \text{sen}\ q$

Formule di Werner

$\text{sen}\ \alpha\ \cos\beta = ½\ [\text{sen}(\alpha + \beta) + \text{sen}(\alpha - \beta)]$
$\cos\alpha\ \cos\beta = ½\ [\cos(\alpha + \beta) + \cos(\alpha - \beta)]$
$\text{sen}\ \alpha\ \text{sen}\ \beta = ½\ [\cos(\alpha - \beta) - \cos(\alpha + \beta)]$

Formule parametriche in tg (x/2)

$\text{sen}\ x = 2\text{tg}\ (x/2) / (1+\text{tg}^2(x/2))$
$\cos x = (1 - \text{tg}^2\ (x/2)) / (1 + \text{tg}^2\ (x/2))$
$\text{tg}\ x = 2\text{tg}(x/2)/(1-\text{tg}^2(x/2))$
$\text{cotg}\ x = (1-\text{tg}^2(x/2)) / 2\text{tg}(x/2)$