Calcola il valore delle seguenti espressioni:

1. $\cos\frac{9}{2}\pi + sen\left(-\frac{13}{2}\pi\right) + \frac{1}{4}\cos(-7\pi) + sen\frac{17}{2}\pi$

$= 0 - 1 + \frac{1}{4}\cdot(-1) + 1 = -1 - \frac{1}{4} + 1 = -\frac{1}{4}$

2. $\dfrac{\sqrt{3}\,sen\frac{7}{3}\pi + \cos(-5\pi) + sen\left(-\frac{11}{6}\pi\right)}{2\,sen\left(-\frac{5}{2}\pi\right) + \cos 4\pi - 4\,sen\frac{5}{2}\pi}$

$= \dfrac{\sqrt{3}\cdot\frac{\sqrt{3}}{2} + (-1) + \frac{1}{2}}{2(-1) + 1 - 4\cdot 1} = \dfrac{\frac{3}{2} - 1 + \frac{1}{2}}{-2 + 1 - 4} = -\frac{1}{5}$

3. $\left[\cos\left(\frac{8}{3}\pi\right) - tg\left(\frac{7}{4}\pi\right) + \sqrt{2}\cos\left(\frac{9}{4}\pi\right)\right]\left[\sqrt{2}\,sen\left(\frac{5}{4}\pi\right) + sen\left(\frac{5}{2}\pi\right)\right]$

$= \left(-\frac{1}{2} - (-1) + \sqrt{2}\cdot\frac{\sqrt{2}}{2}\right)\left(\sqrt{2}\cdot\frac{\sqrt{2}}{2} - 1\right) = \left(-\frac{1}{2} + 1 + 1\right)(1 - 1) = 0$

4. $\left[\frac{5}{\sqrt{3}}\,tg\left(\frac{11}{6}\pi\right) + \frac{8}{3}\,ctg\left(\frac{9}{4}\pi\right) - \cos\pi\right]\left[3 + sen\left(\frac{13}{2}\pi\right)\right]$

$= \left[\frac{5}{\sqrt{3}}\left(-\frac{\sqrt{3}}{3}\right) + \frac{8}{3}\cdot 1 + 1\right](3 + 1) = \left(-\frac{5}{3} + \frac{8}{3} + 1\right)\cdot 4 = 8$

Calcola i valori delle rimanenti funzioni goniometriche, essendo dati:

5. $\cos\ \alpha = -\frac{12}{13} \qquad \pi < \alpha < \frac{3}{2}\pi$

$$sen\ \alpha = -\sqrt{1 - \cos^2\ \alpha} = -\sqrt{1 - \frac{144}{169}} = -\sqrt{\frac{25}{169}} = -\frac{5}{13}$$

$$tg\ \alpha = \frac{-\sqrt{1 - \cos^2\ \alpha}}{\cos \alpha} = -\frac{5}{13} \cdot \left(-\frac{13}{12} \right) = \frac{5}{12}$$

$$ctg\ \alpha = \frac{1}{tg\ \alpha} = \frac{12}{5}$$

6. $tg\ \alpha = \frac{8}{15} \qquad \pi < \alpha < \frac{3}{2}\pi$

$$sen\ \alpha = -\frac{tg\ \alpha}{\sqrt{1 + tg^2\ \alpha}} = -\frac{8}{15} \cdot \frac{1}{\sqrt{1 + \frac{64}{225}}} = -\frac{8}{15} \cdot \frac{15}{17} = -\frac{8}{17}$$

$$\cos\ \alpha = -\frac{1}{\sqrt{1 + tg^2\ \alpha}} = -\frac{1}{\sqrt{1 + \frac{64}{225}}} = -\frac{15}{17}$$

$$ctg\ \alpha = \frac{1}{tg\ \alpha} = \frac{15}{8}$$

Trasforma le seguenti espressioni in altre contenenti solo $sen\ \alpha$:

7. $ctg\ \alpha\ tg\ \alpha - \cos^2\ \alpha + sen\ \alpha \ = 1 - 1 + sen^2\,\alpha + sen\ \alpha = sen^2\,\alpha + sen\ \alpha$

8. $(3 + \cos\ \alpha\ tg\ \alpha)\,(3 - \cos\ \alpha\ tg\ \alpha) + \cos^2\ \alpha\ tg^2\ \alpha - 9\ \cos^2\alpha$

$$= 9 - \cos^2\ \alpha\ tg^2\ \alpha + \cos^2\ \alpha\ tg^2\ \alpha - 9\,(1 - sen^2\,\alpha) = 9 - 9 + 9\,sen^2\ \alpha = 9\ sen^2\,\alpha$$

Trasforma le seguenti espressioni in altre contenenti solo $\cos\ \alpha$:

9. $\dfrac{1}{\cos^2 \alpha} - tg^2\ \alpha + 3$

$$= \frac{1}{\cos^2\ \alpha} - \frac{sen^2\ \alpha}{\cos^2\ \alpha} + 3 = \frac{1 - sen^2\ \alpha}{\cos^2\ \alpha} + 3 = \frac{\cos^2\ \alpha}{\cos^2\ \alpha} + 3 = 1 + 3 = \boxed{4}$$

10. $tg\ \alpha\ sen\ \alpha - \dfrac{1}{\cos\ \alpha} + 2\cos\alpha$

$$= \frac{sen\ \alpha}{\cos\ \alpha}\ sen\ \alpha - \frac{1}{\cos\ \alpha} + 2\cos\alpha = \frac{sen^2\ \alpha - 1}{\cos\ \alpha} + 2\cos\alpha =$$

$$= \frac{-\cos^2\ \alpha}{\cos\alpha} + 2\cos\alpha = -\cos\alpha + 2\cos\alpha = \boxed{\cos\ \alpha}$$