② $$I_2=\int\frac{dx}{1+\cos^2x}=\left|\begin{matrix} z=tg\frac{x}{2} \\ \cos x=\frac{1-z^2}{1+z^2} \\ dx=\frac{2dz}{1+z^2}\end{matrix}\right|=\int\frac{\frac{2dz}{1+z^2}}{1+\left(\frac{1-z^2}{1+z^2}\right)^2}=$$

$$=2\int\frac{dz}{1+z^2+\frac{(1-z^2)^2}{1+z^2}}=2\int\frac{(1+z^2)dz}{(1+z^2)^2-(1-z^2)^2}=2\int\frac{(1+z^2)dz}{1+2z^2+z^4-1+2z^2-z^4}=$$

$$=2\int\frac{(1+z^2)dz}{4z^2}=2\int\frac{dz}{4z^2}+2\int\frac{z^2dz}{4z^2}=$$

$$=\frac{1}{2}\int\frac{dz}{z^2}+\frac{1}{2}\int dz=-\frac{1}{2}\cdot z^{-1}+\frac{1}{2}z+C_2=$$

$$=\frac{z}{2}-\frac{1}{2z}+C_2=\frac{z^2-1}{2z}+C_2=\left|z=tg\frac{x}{2}\right|=$$

$$=\frac{tg^2\frac{x}{2}-1}{2\,tg\frac{x}{2}}+C_2$$

$$I=-2\ln|\cos x|+\ln|\cos^2x+1|+2C_1+\frac{3tg^2\frac{x}{2}-1}{2tg\frac{x}{2}}+3C_2=$$

$$=\cancel{\ln\left|\frac{\cos^2x}{\cos^2x+1}\right|+\frac{3}{2}tg\frac{x}{2}-\frac{1}{2}ctg\frac{x}{2}+C_3}$$

$$=\ln\left|\frac{1+\cos^2x}{\cos^2x}\right|+\frac{3}{2}\left(tg\frac{x}{2}-ctg\frac{x}{2}\right)+C_3$$