$\boxed{0 < x < \frac{\pi}{2}.}$

④ $\int \frac{1}{\cos x + 2}\,dx$ $\qquad t = \tan\frac{x}{2}.$

undef. for $x = (1+2k)\pi,\ k \in \mathbb{Z}.$

$$= \int \frac{1}{\frac{1-t^2}{1+t^2}+2}\left(\frac{2}{1+t^2}\right)dt$$

$$= \int \frac{2}{1-t^2+2+2t^2}\,dt$$

$$= \int \frac{2}{3+t^2}\,dt$$

$$= \frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{t}{\sqrt{3}}\right)+c$$

$$= \frac{2}{\sqrt{3}}\tan^{-1}\left(\frac{\tan\frac{x}{2}}{\sqrt{3}}\right)+c.$$

$\int \frac{1}{\sin \boxed{3x} + \cos \boxed{x}}\,dx$ $\quad \boxed{t = \tan\frac{x}{2}.}$ ⊗ → bad sub.

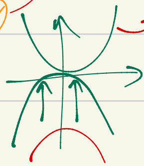
write as $P(\sin x, \cos x)$.

$u = \tan\frac{x}{2}$ good when $P(\sin x, \cos x)$ has low powers of sin, cos.

⑤ $\boxed{\int \frac{1}{3\sin x + 4\cos x}\,dx + c}$

$$= \int \frac{2}{1+t^2}\left(\frac{1}{\frac{6t+4-4t^2}{1+t^2}}\right)dt$$

$$= \int \boxed{\frac{1}{3t+2-2t^2}}\,dt$$



$\to (ax+b)^2 + c^2 > 0\ \forall x$
$(c \neq 0).$

$$= -\int \frac{1}{(2t+1)(t-2)}\,dt$$

$$= -\int \left(\frac{-\frac{2}{5}}{2t+1} + \frac{\frac{2}{5}}{t-2}\right)dt$$

$$= -\frac{2}{5}\ln|t-2| + \frac{1}{5}\ln|2t+1| + c.$$

$$= -\frac{2}{5}\ln\left|\tan\frac{x}{2}-2\right| + \frac{1}{5}\ln\left|2\tan\frac{x}{2}+1\right| + c.$$