15. $f(x) = \sqrt{3}\cos x - \sin x$

① $f'(x) = \sqrt{3}(-\sin x) - \cos x$

$= -\sqrt{3}\sin x - \cos x$

② $-\sqrt{3}\sin x - \cos x = 0$

$-\cos x = \sqrt{3}\sin x$

$(-\cos x)^2 = (\sqrt{3}\sin x)^2$

$\cos^2 x = 3\sin^2 x$

$\sin^2 + \cos^2 = 1$

$\sin^2 = 1 - \cos^2$

$\cos^2 x = 3(1 - \cos^2 x)$

$\cos^2 x = 3 - 3\cos^2 x$

$\cos^2 x + 3\cos^2 x = 3$

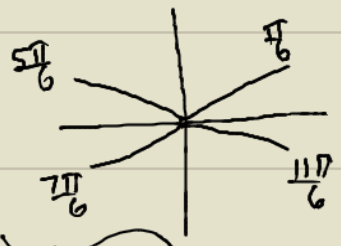
$4\cos^2 x = 3$

$\cos^2 x = \frac{3}{4}$

$\cos x = \pm\sqrt{\frac{3}{4}}$

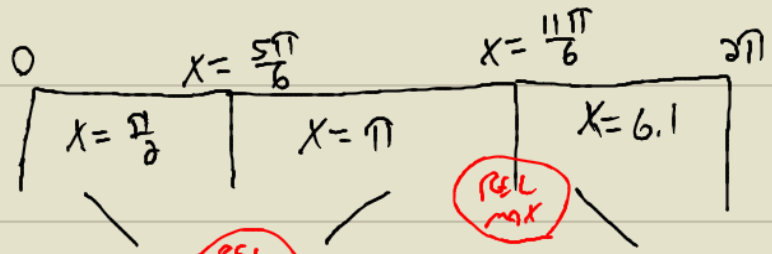
$\cos x = \pm\frac{\sqrt{3}}{\sqrt{4}}$

$\cos x = \pm\frac{\sqrt{3}}{2}$



$x = \cancel{\frac{\pi}{6}}, \frac{5\pi}{6}, \cancel{\frac{7\pi}{6}}, \frac{11\pi}{6}$

③



DEC $(0, \frac{5\pi}{6})$

INC $(\frac{5\pi}{6}, \frac{11\pi}{6})$

DEC $(\frac{11\pi}{6}, 2\pi)$

④ REL MIN: $x = \frac{5\pi}{6}$

$y = \sqrt{3}\cos x - \sin x$

$y = \sqrt{3}\cos\frac{5\pi}{6} - \sin\frac{5\pi}{6}$

$y = \sqrt{3}\left(\frac{-\sqrt{3}}{2}\right) - \frac{1}{2}$

$= \frac{-3}{2} - \frac{1}{2}$

$= -2$

REL MIN $\left(\frac{5\pi}{6}, -2\right)$

REL MAX: $x = \frac{11\pi}{6}$

$y = \sqrt{3}\cos x - \sin x$

$y = \sqrt{3}\cos\frac{11\pi}{6} - \sin\frac{11\pi}{6}$

$y = \sqrt{3}\left(\frac{\sqrt{3}}{2}\right) - \left(-\frac{1}{2}\right)$

$y = \frac{3}{2} + \frac{1}{2}$

$y = 2$

REL MAX $\left(\frac{11\pi}{6}, 2\right)$