STEP/Trigonometry Q2 (30/6/23)

What is the period of $2\,sin\left(3x+\frac{\pi}{4}\right)+3cos\,(\frac{2x}{3}-\frac{\pi}{3})$?

Solution

The period T_1 of $2\,sin\left(3x+\frac{\pi}{4}\right)$ satisfies $3T_1 = 2\pi$

[as $2sin\left(3[0]+\frac{\pi}{4}\right) = 2sin\left(2\pi+\frac{\pi}{4}\right)$]; ie $T_1 = \frac{2\pi}{3}$

Similarly for $3cos\,(\frac{2x}{3}-\frac{\pi}{3})$, $\frac{2T_2}{3} = 2\pi$, so that $T_2 = 3\pi$

The period of the sum of these functions is the LCM of these two periods; ie 6π.