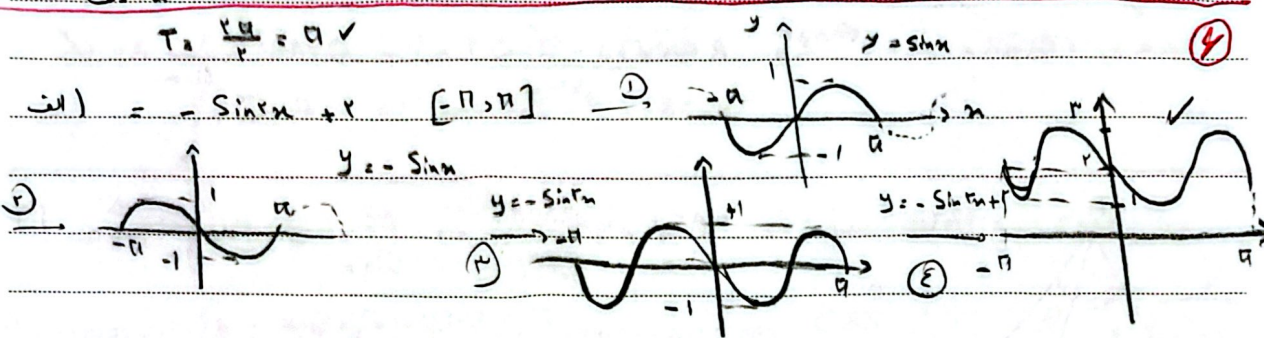


$$x = r \cos \alpha \rightarrow r(\cos^2 \alpha - \sin^2 \alpha) = r \cos^2 \alpha - r \sin^2 \alpha = 1 \quad (1)$$

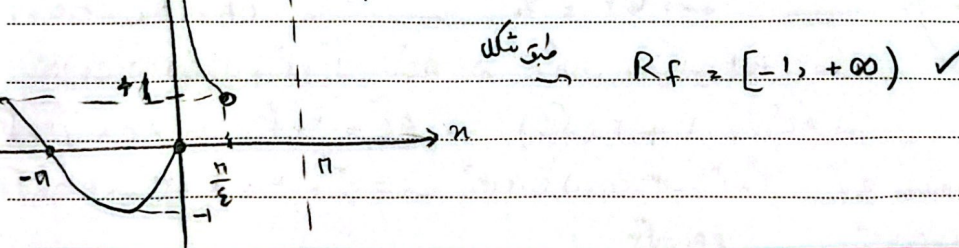
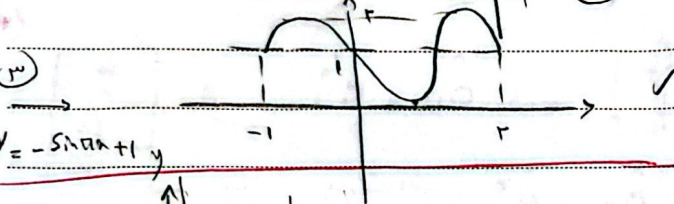
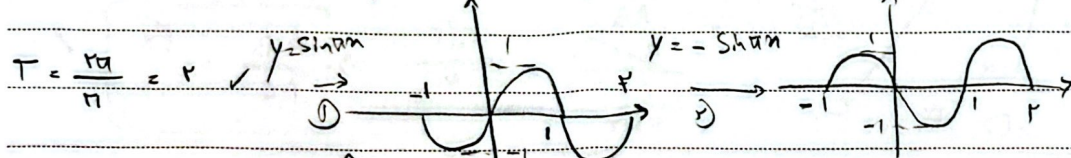
$$\rightarrow r(\cos^2 \alpha - \sin^2 \alpha) = (\cos^2 \alpha + \sin^2 \alpha) = 1 \rightarrow r(\cos^2 \alpha - \sin^2 \alpha)(\cos^2 \alpha + \sin^2 \alpha) = 1$$

$$\frac{\cos^2 \alpha - \sin^2 \alpha}{\cos^2 \alpha + \sin^2 \alpha} = 1 \rightarrow \cos^2 \alpha = 1 \rightarrow \sin^2 \alpha = 0 \checkmark$$

$$\frac{\cos^2 \alpha - \sin^2 \alpha}{\cos^2 \alpha + \sin^2 \alpha} = 1 \rightarrow \cos^2 \alpha = 1 \rightarrow \sin^2 \alpha = 0 \checkmark$$



$$\rightarrow y = r \cos(\frac{\pi}{2} + \alpha) + 1 \quad [-\pi, \pi] \rightarrow y = -r \sin \alpha + 1$$



$$f(x) = a + b \frac{\sin(x\omega)}{\frac{1}{\omega} \sin(x\omega)} \cos(x\omega) \rightarrow f(x) = a + \frac{b}{\omega} \frac{\sin(x\omega) \cos(x\omega)}{\frac{1}{\omega} \sin(x\omega)}$$

$$\rightarrow f(x) = a + \frac{b}{\omega} \sin(x\omega) \rightarrow \frac{y_{\min} + y_{\max}}{2} = a$$

$$\rightarrow a = \frac{0 + \varepsilon}{2} = \frac{\varepsilon}{2} \checkmark, \quad \frac{b}{\omega} + a = \varepsilon \rightarrow \frac{b}{\omega} + \frac{\varepsilon}{2} = \varepsilon \rightarrow \frac{b}{\omega} = \frac{\varepsilon}{2} \rightarrow b = \frac{\omega \varepsilon}{2}$$

$T = \frac{2\pi}{\omega} = \frac{2\pi}{10} = \frac{\pi}{5} = \frac{\varepsilon}{10} \rightarrow \frac{\pi}{5} = \frac{\varepsilon}{10} \rightarrow \boxed{C = \frac{\omega}{\varepsilon}}$

$\Rightarrow \frac{b}{a} = \frac{1 \times \omega}{\pi \times \varepsilon} = \frac{\omega}{\pi \varepsilon} \checkmark$

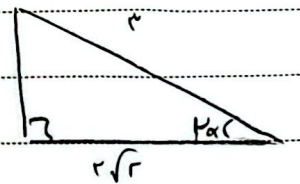
$$f(x) = a \cos bx + c \rightarrow c = \frac{y_{\min} + y_{\max}}{2} = \frac{-\varepsilon + r}{2} = -1 \quad (9)$$

$$|a| - 1 = r \rightarrow |a| = r \quad \frac{a \cdot r}{\text{طبق الشرط}} \quad a = -r$$

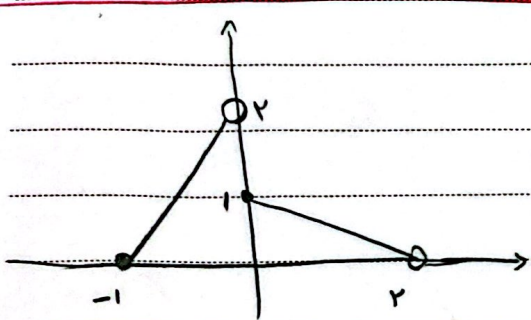
$$\rightarrow f(x) = -r \cos bx - 1 \quad x = \pi \quad f(x) = -r \cos ab - 1 = -\varepsilon$$

$$\cos ab = 1 \rightarrow ab = 2\pi \rightarrow b = r \rightarrow f(x) = -r \cos rx - 1$$

$$x = \pi \rightarrow 0 = -r \cos r\pi - 1 \rightarrow \cos r\pi = -\frac{1}{r} \rightarrow$$



$$\rightarrow |\tan r\pi| = \frac{1}{r\sqrt{r}} = \frac{r}{\sqrt{r}} = \boxed{\frac{\sqrt{r}}{\varepsilon}} \checkmark$$



$$f(x) = \begin{cases} rx + r & -1 \leq x < 0 \\ -\frac{1}{r}x + 1 & 0 \leq x < r \end{cases}$$

(10)

$$f(x+nT) = f(x) \quad \text{دالة دورية}$$

$$f(-\frac{r}{2}\omega) = f(-\frac{1}{\omega}(\frac{r}{2}\omega)) = f(-\frac{1}{\omega}) = f(-\frac{1}{\omega} + r) = f(\frac{1}{\omega})$$

$$\rightarrow f(\frac{1}{\omega}) = -\frac{1}{r} \cdot \frac{r}{\omega} + 1 = -\frac{r}{\varepsilon} + \frac{\varepsilon}{\varepsilon} = \boxed{\frac{1}{\varepsilon}} \checkmark$$