Vertical Shift ± Down b units

$y = \boxed{f(x) - b}$

$y = -\frac{1}{4}\cos\left(\frac{1}{2}x + \frac{\pi}{2}\right) - 1$

① Amplitude

$A = \left|-\frac{1}{4}\right| = \frac{1}{4}$

$f(y)$

$y = -\frac{1}{4}\cos\frac{1}{2}\left[x + \pi\right] - 1$

② Factor $\frac{1}{2}$

$\frac{1}{2}\left[\frac{2}{1}\cdot\frac{1}{2}x + \frac{\pi}{2}\cdot\frac{2}{1}\right]$

$\downarrow$

$[x + \pi]$

③ Period or $P = \frac{2\pi}{|B|}$ $\quad B = \frac{1}{2}$ Amplitude: 1/4 Period: 4π

$P = \frac{2\pi}{|1/2|} = 2\pi \cdot \frac{2}{1} = \boxed{4\pi}$

④ Phase Shift Horizontal Shift left π units

$y = f(x + b)$

$y = \left[-\frac{1}{4}\cos\frac{1}{2}[x + \pi]\right] - 1$

⑤ Phase Shift Vertical Shift down 1 unit

$y = f(x) - b$

$y = \left[-\frac{1}{4}\cos\frac{1}{2}[x + \pi]\right] - 1$

$$C(x) = A\cos(\omega x + \phi) + B$$

$$y = \underset{A}{-\frac{1}{4}}\cos\left(\underset{\omega}{\frac{1}{2}}x + \underset{\phi}{\frac{\pi}{2}}\right)\underset{B}{-1}$$

$A = |-\frac{1}{4}| = \frac{1}{4}$

P : 4π
PS : $-\pi$
VS : -1

Period $\frac{2\pi}{\omega} = \frac{2\pi}{\frac{1}{2}} = 2\pi\left(\frac{2}{1}\right) = \boxed{4\pi}$

Phase Shift: $-\frac{\phi}{\omega} = -\left(\frac{\pi/2}{1/2}\right) = -\left(\frac{\pi}{\not{2}_1}\cdot\frac{2}{1}\right) = \boxed{-\pi}$ Move left π units

Vertical Shift: $B = -1$ Move down 1 unit

$$S(x) = A\sin(\omega x + \phi) + B$$

$$\underset{A}{5}\sin\left(\underset{\omega}{6}x - \underset{\phi}{\frac{\pi}{3}}\right)$$

P : $\pi/3$
PS : $\pi/6$