$$X_a(\Omega) = \begin{cases} \cos(\Omega) & \frac{-\pi}{2} < \Omega \leq \frac{\pi}{2} \\ 0 & \text{o.w.} \end{cases}$$

$$X_b(\Omega) = \begin{cases} \left|\frac{3\Omega}{\pi}\right| & \frac{-\pi}{3} < \Omega \leq \frac{\pi}{3} \\ 0 & \text{o.w.} \end{cases}$$

$$x[n] = \frac{1}{2\pi} \int_{-\pi}^{\pi} X(\Omega)\, e^{j\Omega n}\, d\Omega$$

$$x_a[n] = \frac{1}{2\pi} \int_{\frac{-\pi}{2}}^{\pi/2} \cos(\Omega)\, e^{j\Omega n}\, d\Omega$$

with integration by parts:

$$\int u\,dv = uv - \int v\,du$$

let:

$u = \cos(\Omega) \quad dv = e^{j\Omega n}\, d\Omega$

$du = -\sin(\Omega)\, d\Omega \quad v = \frac{e^{j\Omega n}}{jn}$

$$\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos(\Omega)\, e^{j\Omega n}\, d\Omega = \cos(\Omega)\frac{e^{j\Omega n}}{jn} + \frac{1}{jn}\underbrace{\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin(\Omega)\, e^{j\Omega n}\, d\Omega}_{\text{I.B.P.}}$$

let:

$u = \sin(\Omega) \quad dv = e^{j\Omega n}\, d\Omega$

$du = \cos(\Omega)\, d\Omega \quad v = \frac{e^{j\Omega n}}{jn}$

let $A = \int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos(\Omega) e^{j\Omega n}\, d\Omega$

$$A = \cos(\Omega)\frac{e^{j\Omega n}}{jn} + \frac{1}{jn}\left[\sin(\Omega)\frac{e^{j\Omega n}}{jn} - \frac{1}{jn}\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \cos(\Omega) e^{j\Omega n}\, d\Omega\right]$$

$$A = \cos(\Omega)\frac{e^{j\Omega n}}{jn} - \frac{\sin(\Omega)\, e^{j\Omega n}}{n^2} + \frac{1}{n^2} A$$

$$A\left(1 - \frac{1}{n^2}\right) = -j\cos(\Omega)\frac{e^{j\Omega n}}{n} - \frac{\sin(\Omega) e^{j\Omega n}}{n^2}$$

$$A = \frac{-\sin(\Omega)\, e^{j\Omega n}}{n^2 - 1} - j\frac{n\cos(\Omega)\, e^{j\Omega n}}{n^2 - 1} = \frac{-\sin(\Omega)\, e^{j\Omega n} - jn\sin(\Omega) e^{j\Omega n}}{n^2 - 1}$$