Subject

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$$F_s\{f\} = \sqrt{۲/\pi}\int_۰^۱ \sin wx\,dx = ۱/w\sqrt{۲/\pi}\cos wx\Big]_۰^۱$$

$$= \sqrt{۲/\pi}\;\frac{۱-\cos w}{w}$$

ج ۹ - b

$$F_c\{f\} = \sqrt{۲/\pi}\int_۰^\infty e^{-ax}\cos wx\,dx = \sqrt{۲/\pi}\;\frac{e^{-ax}}{a^۲+w^۲}\Big($$

$$-a\cos wx + w\sin wx\Big)_۰^\infty = \sqrt{۲/\pi}\;\frac{a}{a^۲+w^۲}$$

$$F_s\{f\} = \sqrt{۲/\pi}\int_۰^\infty e^{-ax}\sin wx\,dx = \sqrt{۲/\pi}\times\frac{e^{-ax}}{a^۲+w^۲}\Big($$

$$-a\sin wx - w\cos wx\Big)_۰^\infty = \sqrt{۲/\pi}\left(۰-\frac{۱}{a^۲+w^۲}(۰-w)\right)$$

$$= \sqrt{۲/\pi}\left(\frac{w}{a^۲+w^۲}\right)$$

ج ۱۰ -

$$\sqrt{۲\pi}\,F\{f\} = \int_{-\infty}^{\infty} f(x)e^{-iwx}\,dx = \int_{-۱}^{۱}(۱-x^۲)e^{-iwx}\,dx$$

$$\rightarrow \sqrt{۲\pi}\,F\{f\} = \left[\left(-\frac{۱}{iw}(۱-x^۲) + \frac{۲x}{(iw)^۲} + \frac{۲}{(iw)^۳}\right)e^{-iwx}\right]_{-۱}^{۱}$$

$$= \left(\frac{۲}{(iw)^۲} + \frac{۲}{(iw)^۳}\right)e^{-iw} - \left(\frac{۲}{(iw)^۳} - \frac{۲}{(iw)^۲}\right)e^{iw} = \frac{۲}{(iw)^۲}\Big(e^{-iw}$$

$$+ e^{iw}\Big) - \frac{۲}{(iw)^۳}\left(e^{iw} - e^{-iw}\right) = \frac{۱}{(iw)^۲}\cos w - \frac{۱}{(iw)^۳}\,i\sin w$$

$$= -\frac{\cos w}{w^۲} + \frac{۱}{w^۳}\sin w$$