$$I = \left[\tfrac{1}{a}\cos(bt)e^{at}\right]_0^x + \tfrac{b}{a}\int_0^x e^{at}\sin(bt)\,dt$$

$$= \tfrac{1}{a}\left(e^{ax}\cos(bx) - 1\right) + \tfrac{b}{a}J$$

c. $\therefore \tfrac{1}{a}\left(e^{ax}\cos(bx) - 1\right) + \tfrac{b}{a}J = \tfrac{1}{b}e^{ax}\sin(bx) - \tfrac{a}{b}J$

$$b\left(e^{ax}\cos(bx) - 1\right) + b^2 J = ae^{ax}\sin(bx) - a^2 J$$

$$\therefore (a^2+b^2)J = e^{ax}\left(a\sin(bx) - b\cos(bx)\right) + b$$

$$\therefore J = \frac{e^{ax}\left(a\sin(bx) - b\cos(bx)\right) + b}{a^2+b^2}$$

$$I = \tfrac{1}{b}e^{ax}\sin(bx) - \tfrac{a}{b}J$$

$$= \tfrac{1}{b}e^{ax}\sin(bx) - \frac{ae^{ax}\left(a\sin(bx) - b\cos(bx)\right) + ab}{b(a^2+b^2)}$$

$$= \tfrac{1}{b}\left(\frac{e^{ax}(a^2+b^2)\sin(bx) - e^{ax}\left(a^2\sin(bx) - ab\cos(bx)\right) + ab}{a^2+b^2}\right)$$

$$= \frac{e^{ax}\left(b\sin(bx) + a\cos(bx)\right) + a}{a^2+b^2}$$

d. $I + iJ = \int_0^x e^{at}\cos(bt)\,dt + i\int_0^x e^{at}\sin(bt)\,dt$

$$= \int_0^x e^{at}\left(\cos(bt) + i\sin(bt)\right)dt$$

$$= \int_0^x e^{at}e^{ibt}\,dt$$

$$= \int_0^x e^{(a+bi)t}\,dt$$

$$= \left[\frac{1}{a+bi}e^{(a+bi)t}\right]_0^x$$