$$\therefore I + iJ = \frac{1}{a+bi}\left(e^{(a+bi)x} - 1\right)$$

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

$$= \frac{(a-bi)(e^{ax}\cos(bx) + ie^{ax}\sin(bx) - 1)}{a^2+b^2}$$

$$= \frac{ae^{ax}\cos(bx) + aie^{ax}\sin(bx) - a - bie^{ax}\cos(bx) + be^{ax}\sin(bx) + bi}{a^2+b^2}$$

$$= \frac{e^{ax}(b\sin(bx) + a\cos(bx)) + a}{a^2+b^2} + i\,\frac{e^{ax}(a\sin(bx) - b\cos(bx)) + b}{a^2+b^2}$$

$$\therefore I = \frac{e^{ax}(b\sin(bx) + a\cos(bx)) \overset{-}{\cancel{+}} a}{a^2+b^2}$$

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

15a. Let $I_n = \int_0^1 (1-x^{n-1})^n \, dx$

By integration by parts on I_n:

	D	I
+	$(1-x^{n-1})^n$	1
-	$-n(n-1)x^{n-2}(1-x^{n-1})^{n-1}$	x

$$I_n = \left[x(1-x^{n-1})^n\right]_0^1 + n(n-1)\int_0^1 x^{n-1}(1-x^{n-1})^{n-1}\,dx$$

$$= n(n-1)\int_0^1 x^{n-1}(1-x^{n-1})^{n-1}\,dx$$

$$= n(1-n)\int_0^1 -x^{n-1}(1-x^{n-1})^{n-1}\,dx$$

$$= n(1-n)\int_0^1 \left((1-x^{n-1})(1-x^{n-1})^{n-1} - (1-x^{n-1})^{n-1}\right)dx$$