8a $\langle L_1, L_2 \rangle = \int_0^\infty (1-x)(x^2-4x+2)e^{-x}\,dx = 0$

$$= \int_0^\infty (x^2-4x+2 \quad -x^3+4x^2-2x)e^{-x}\,dx$$

$$= \int_0^\infty -x^3e^{-x} + 5x^2e^{-x} - 6xe^{-x} + 2e^{-x}\,dx$$

$$= \lim_{b\to\infty} \int_0^b \overbrace{-x^3e^{-x}}^{\alpha} + \overbrace{5x^2e^{-x}}^{\beta} - \overbrace{6xe^{-x}}^{\gamma} + \overbrace{2e^{-x}}^{\delta}\,dx$$

$$\left\{\begin{matrix} u=-x^3 & dv=-e^{-x}dx \\ du=-3x^2dx & v=e^{-x} \end{matrix}\right\}$$

$$\alpha = -x^3e^{-x}\Big|_0^b + 3\int_0^b x^2e^{-x}\,dx$$

$$\left\{\begin{matrix} u=x^2 & dv=e^{-x}dx \\ du=2x\,dx & v=-e^{-x} \end{matrix}\right\}$$

$$3\left[-x^2e^{-x}\Big|_0^b + 2\int_0^b xe^{-x}\,dx\right]$$

$$\left\{\begin{matrix} u=x & dv=e^{-x}dx \\ du=dx & v=-e^{-x} \end{matrix}\right\}$$

$$2\left[-xe^{-x}\Big|_0^b + \int_0^b e^{-x}\,dx\right]$$