8b $\langle L_0, L_2 \rangle = \int_0^\infty (x^2 - 4x + 2)e^{-x}\,dx$

$$= \lim_{b\to\infty} \underbrace{\int_0^b x^2 e^{-x}\,dx}_{\alpha} \underbrace{- 4\int_0^b x e^{-x}\,dx}_{\beta} + \underbrace{2\int_0^b e^{-x}\,dx}_{\Gamma}$$

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

$$\beta = -4\left[-xe^{-x}\Big|_0^b + \int_0^b e^{-x}dx\right] = -4\left[-be^{-b} - e^{-x}\Big|_0^b\right] = -4\left[-be^{-b} - e^{-b} + 1\right]$$

$$\lim_{b\to\infty} \beta = -4$$

$$\Gamma = -2\,e^{-x}\Big|_0^b = -2e^{-b} + 2$$

$$\lim_{b\to\infty} \Gamma = 2$$

$$\langle L_0, L_2 \rangle = \lim_{b\to\infty}(\alpha - \beta + \Gamma) = 2 - 4 + 2 = 0$$