$$x^2\,\Psi'' + 3x\Psi' + \big(Ax^2 - B\big)\,\Psi = 0 \qquad ; \qquad x > 0$$

$$P_0(x) = x^2 \qquad ; \qquad P_1(x) = 3x \qquad ; \qquad P_2(x) = Ax^2 - B$$

(a) Clearly, $P_0' = 2x \neq P_1$, so the equation is not self-adjoint.

(b) The "integrating factor" is

$$\begin{aligned} f(x) &= \exp\left\{\int^x \frac{P_1 - P_0'}{P_0}\right\} dx' \\ &= \exp\{\log x\} \\ &= x \end{aligned}$$

so multiply the B-W equation through by x:

$$x^3\,\Psi'' + 3x^2\Psi' + \big(Ax^3 - Bx\big)\,\Psi = 0$$

which is equivalent to the manifestly self-adjoint

$$\big(x^3\Psi'\big)' + Ax^3\Psi - Bx\Psi = 0$$

(c) Treating A as the eigenvalue, group terms this way:

$$\Big\{\big(x^3\Psi'\big)' - Bx\Psi\Big\} + Ax^3\Psi = 0$$

which yields the self-adjoint S-L eigenvalue problem

$$\mathcal{L}\Psi_n + \lambda_n w(x)\Psi_n = 0$$

with identifications

$$\mathcal{L} = \big(x^3\Psi'\big)' - Bx\Psi \qquad ; \qquad \lambda_n = A \qquad ; \qquad w(x) = x^3$$