Consider the following properties of the Laplace transform:

(i) \(\mathcal{L}\{e^{ct} f(t)\}(s) = F(s - c)\)

(ii) \(\mathcal{L}\{t^n f(t)\}(s) = (-1)^n F^{(n)}(s)\)

We also know that \(\mathcal{L}\{e^{at}\}(s) = \frac{1}{s - a}\), and \(\mathcal{L}\{t^n\}(s) = \frac{n!}{s^{n+1}}\), and \(\mathcal{L}\{\cos bt\}(s) = \frac{s}{s^2 + b^2}\).

1. Compute the Laplace transform of \(t^2 e^{3t}\) using Property (i).

2. Compute the Laplace transform of \(t^2 e^{3t}\) using Property (ii).
3. Compute the Laplace transform of $e^{2t} \cos 3t$. 