

[gex62] Laplace transform of derivatives of functions

Consider a function $f(t)$ that is at least n times differentiable. Show by induction and the use of integration by parts that the Laplace transform of $f^{(n)}(t)$, the n^{th} derivative of $f(t)$, is related to Laplace transform of $f(t)$ as follows:

$$\mathcal{L}\{f^{(n)}(t)\} = s^n \mathcal{L}\{f(t)\} - s^{n-1} f(0) - s^{n-2} f^{(1)}(0) - \dots - f^{(n-1)}(0).$$

Solution: