The Laplace Transform by Definition Part I

Definition: Let f be a function defined for $t \geq 0$. Then the integral $\mathcal{L}\{f(t)\} = \int_0^\infty e^{-st} f(t)\, dt$ is said to be the *Laplace Transform* of f, provided the integral converges.

1. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that

$$f(t) = \begin{cases} -1 & 0 \leq t < 1 \\ 1 & t \geq 1 \end{cases}$$

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2. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that

$$f(t) = \begin{cases} t & 0 \leq t < 1 \\ 1 & t \geq 1 \end{cases}$$

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3. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that

$$f(t) = \begin{cases} sin(t) & 0 \leq t < \pi \\ 0 & t \geq \pi \end{cases}$$

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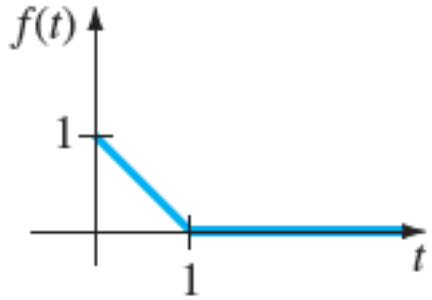
4. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that



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5. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that $f(t) = e^{t+7}$

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6. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that $f(t) = te^{4t}$

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7. Use the definition of the Laplace Transform to find $\mathcal{L}\{f(t)\}$, given that $f(t) = t \cdot cos(t)$