1. (1 point)

(1) Set up an integral for finding the Laplace transform of $f(t) = 1$. (Don'd forget any dt terms.)

$F(s) = \mathcal{L}\{f(t)\} = \int_A^B$ ________ help (formulas)

where $A =$ ___ and $B =$ ___. (Note: use the word INFINITY for ∞.)

(2) Find the antiderivative (with constant term 0) corresponding to the previous part.

____

(3) Evaluate appropriate limits to compute the Laplace transform of $f(t)$:

$F(s) = \mathcal{L}\{f(t)\} =$ ________

(4) Where does the Laplace transform you found exist? In other words, what is the domain of $F(s)$?

________ help (inequalities)

Solution:
SOLUTION:
The desired integral is

$$\mathcal{L}4 = \int_0^\infty 4e^{-st}\,dt.$$

Thus, the desired input into the integral is "$4e^{-st}\,dt$" while $A = 0$ and $B =$INFINITY. The antiderivative, meanwhile, is

$$-\frac{4}{s}e^{-st}.$$

Evaluating the limit, we find

$$\begin{aligned}\lim_{b\to\infty}\left(-\frac{4}{s}e^{-st}\right)\Big|_0^b &= \lim_{b\to\infty}\left[\left(-\frac{4}{s}e^{-sb}\right) - \left(-\frac{4}{s}e^{0}\right)\right]\\ &= -\frac{4}{s},\end{aligned}$$

where we assumed that $s > 0$ so that $\lim_{b\to\infty}\left(-\frac{4}{s}e^{-sb}\right) = 0$.

Correct Answers:

- `1*e^(-s*t)*dt`
- `0`
- `infinity`
- `1/-s*e^(-s*t)`
- `1/s`
- `s > 0`

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2. (1 point)

Use the definition of the Laplace transform to find $F(s) = \mathcal{L}\{f(t)\}$ for the function $f(t) = e^{3t+8}$, for $s > 3$.

$F(s) = \mathcal{L}\{f(t)\} =$ ____________________ help (formulas)

Solution:
SOLUTION:
We find

$$\begin{aligned}\mathcal{L}\left\{e^{3t+8}\right\} &= \int_0^\infty e^{-st}e^{3t+8}\,dt\\ &= e^8\int_0^\infty e^{(3-s)t}\,dt\\ &= e^8\lim_{b\to\infty}\int_0^b e^{(3-s)t}\,dt\\ &= e^8\lim_{b\to\infty}\frac{e^{(3-s)t}}{(3-s)}\Big|_0^b\\ &= \frac{e^8}{(3-s)}\lim_{b\to\infty}\left(e^{(3-s)b} - e^0\right)\\ &= \frac{e^8}{(3-s)}\lim_{b\to\infty}(0-1)\\ &= \frac{e^8}{(s-3)}.\end{aligned}$$

where we asumed $s > 3$.

Correct Answers:

- `e^8/(s-3)`