Matthew Mendoza **Math-45-Krauel-F20**

Assignment Math45-Homework-WEEK-12 due 11/25/2020 at 11:59pm PST

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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)

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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)

Answer:

Given that;

By the definition of laplace transforms

$$F(s) = L\{f(t)\}$$
$$= \int_0^\infty e^{-st} f(t)\, dt$$

from question $f(t) = 6$.

(a)

$$F(s) = L\{f(t)\} = \int_0^\infty e^{-st} f(t)\, dt$$
$$= \int_0^\infty e^{-st}\, 6\, dt$$
$$= 6 \int_0^\infty e^{-st}\, dt$$
$$= 6 \left[\frac{e^{-st}}{-s}\right]_0^\infty$$
$$= \frac{-6}{s}\left[e^{-\infty} - e^0\right]$$
$$= \frac{-6}{s}(0-1)$$
$$= -\frac{6}{s}(-1) \qquad \left(e^{-\infty} = 0,\ e^0 = 1\right)$$
$$= 6/s$$

$\boxed{F(s) = L\{f(t)\} = \int_0^\infty e^{-st}\, 6\, dt}$ only want this one for part (a)

and $\boxed{A=0}$ and $\boxed{B=\infty}$

(b) finding an antiderivative corresponding to previous part.

$$F(s) = 6 \int_0^\infty e^{-st}\, dt$$

$\boxed{F(s) = 6\left[\frac{e^{-st}}{-s}\right]_0^\infty}$ only want this one for part (b).

$$= \frac{-6}{s}\left(e^{-\infty} - e^0\right]$$
$$= -\frac{6}{s}[0-1]$$
$$= \frac{6}{s}$$

$\therefore \boxed{F(s) = \frac{6}{s}}$

(c) evaluating appropriate limits to be computing L.T of $f(t)$

$$F(S) = L\{f(t)\}$$
$$= \frac{-6}{s}\left[e^{-\infty} - e^0\right]$$
$$= -\frac{6}{s}(0-1]$$
$$= -\frac{6}{s}(-1) = 6/s$$

$\boxed{F(S) = 6/s}$

(d) where does the Laplace transform you found exist and what domain exist

Domain of $F(s)$ is all real numbers

Except for $s=0$.

Domain of $f(s) = \frac{6}{s} = \frac{6}{s} = (-\infty, 0) \cup (0, +\infty)$

$$\boxed{\text{Domain of } f(s) = \frac{6}{s} \text{ at } (-\infty, 0) \cup (0, +\infty)}$$

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Laplace Transform of e^{3t+8}: $\frac{e^8}{s-3}$

Steps

$L\{e^{3t+8}\}$

Use the constant multiplication property of Laplace Transform:
For function $f(t)$ and constant a: $L\{a \cdot f(t)\} = a \cdot L\{f(t)\}$

$= e^8 L\{e^{3t}\}$

$L\{e^{3t}\}$: $\frac{1}{s-3}$

Hide Steps

$L\{e^{3t}\}$

Use Laplace Transform table: $L\{e^{at}\} = \frac{1}{s-a}$

$L\{e^{3t}\} = \frac{1}{s-3}$

$= \frac{1}{s-3}$

$= e^8 \frac{1}{s-3}$

Refine $e^8 \frac{1}{s-3}$: $\frac{e^8}{s-3}$

Hide Steps

$e^8 \frac{1}{s-3}$

Multiply fractions: $a \cdot \frac{b}{c} = \frac{a \cdot b}{c}$

$= \frac{1 \cdot e^8}{s-3}$

Multiply: $1 \cdot e^8 = e^8$

$= \frac{e^8}{s-3}$

$= \frac{e^8}{s-3}$