

Definition of Laplace Transform

Choose the correct answer

Use the definition of Laplace Transform, $F(s) = \int_0^{\infty} e^{-st} f(t) dt$ to construct the Laplace Transform for $f(t) = 2e^{-6t}$.

SOLUTION

$$\begin{aligned} F(s) &= \int_0^{\infty} e^{-st} f(t) dt \\ &= \int_0^{\infty} e^{-st} (2e^{-6t}) dt \\ &= \boxed{\text{Q1}} \\ &= 2 \int_0^{\infty} e^{-(s+6)t} dt \\ &= \boxed{\text{Q2}} \\ &= 2 \left[\frac{e^{-(s+6)\infty}}{-(s+6)} - \frac{e^{-(s+6)0}}{-(s+6)} \right] \\ &= \boxed{\text{Q3}} \\ &= \frac{2}{s+6} \end{aligned}$$

Q1

$$2 \int_0^{\infty} e^{-st-(-6t)} dt$$

$$2 \int_0^{\infty} e^{-st+(-6t)} dt$$

$$2 \int_0^{\infty} e^{-st+(6t)} dt$$

Q2

$$2 \left[\frac{e^{-(s+6)t}}{(s+6)} \right]_0^{\infty}$$

$$2 \left[\frac{e^{(s+6)t}}{(s+6)} \right]_0^{\infty}$$

$$2 \left[\frac{e^{-(s+6)t}}{-(s+6)} \right]_0^{\infty}$$

Q3

$$2 \left[0 - \frac{1}{s+6} \right]$$

$$2 \left[0 + \frac{1}{s+6} \right]$$

$$2 \left[0 + \frac{1}{s-6} \right]$$