

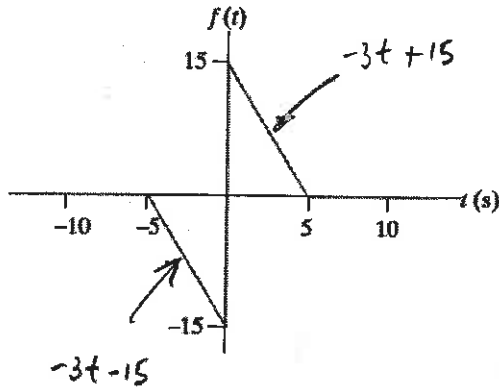
SOLUTION

ECE222

Quiz 5

To get full credit, show all your work.

- 1) Use step functions to write the expression for the function shown below.



$$f(t) = (-3t - 15) [u(t+5) - u(t)] + (-3t + 15) [u(t) - u(t-5)]$$

- 2) Show all the steps to derive the Laplace transform for the function $f(t) = t$.

$$F(s) = \int_0^{\infty} f(t) e^{-st} dt \Rightarrow \int_0^{\infty} t e^{-st} dt = \left. -\frac{1}{s} e^{-st} t \right|_0^{\infty} - \int_0^{\infty} (1) \left(-\frac{1}{s}\right) e^{-st} dt$$

$\Rightarrow \int_0^{\infty} t e^{-st} dt$

integrate by parts:

$$\int u dv = uv - \int v du$$

let $u = t, dv = e^{-st}$

$$\Rightarrow du = 1, v = -\frac{1}{s} e^{-st}$$
$$= -\frac{1}{s} \left. \frac{1}{s} e^{-st} \right|_0^{\infty} = \frac{1}{s^2}$$

- 3) Does the function $f(t) = 4\delta(t)$ have a greater amplitude than function $g(t) = 3\delta(t)$? If so, find the difference in amplitudes. Or, if not, what is the essential difference between these two functions?

AMPLITUDES ARE NOT DIFFERENT, BUT THE AREAS ARE DIFFERENT. AREA OF $f(t) >$ AREA OF $g(t)$
(= 4) (= 3)