

Solve the following unrelated problems.

1. Compute the indefinite integral

$$\int (2te^{7t} + 10) dt$$

using integration by parts:

$$\int uv' = uv - \int u'v.$$

2. The Laplace transform, $F(s)$, of a time-function $f(t)$ is given by:

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

Applying the definition, find the Laplace transform of the following functions:

(a) $f_1(t) = 3e^{3t}$

(b) $f_2(t) = 5 \cos(0) + 2e^{-2t}$

3. Simplify the following expression

$$\frac{z_2^*}{z_1 z_3}$$

where

$$z_1 = 4 + 2j, z_2 = 6 - 5j, z_3 = -1 + 4j.$$

The notation z^* defines the complex conjugate of a complex number.