Problem S3.2

Obtain the Laplace transform of $f = t\,e^{-5t}$

Solution:

$$F(s) = \int_0^\infty t\,e^{-5t}e^{-st}dt = \int_0^\infty t\,e^{-(s+5)t}dt$$

Using integration by parts, Let

$$u = t,\ \ dv = e^{-(s+5)t}dt \Rightarrow du = dt,\ \ \ v = -\frac{e^{-(s+5)t}}{s+5}$$

$$F(s) = -\frac{e^{-(s+5)t}}{s+5}\ t\Big|_0^\infty + \int_0^\infty -\frac{e^{-(s+5)t}}{s+5}dt\ \ = \frac{1}{(s+5)^2}$$