Exercises

1. Calculate the Laplace transform of the following functions:

   (a) $te^{2t}\cos(3t)$

   (b) $t\sin^2(2t)$

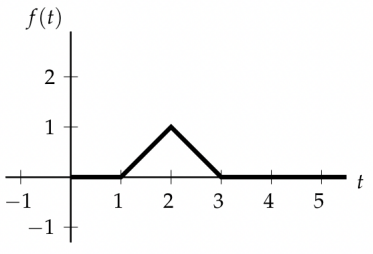
   (c) $e^{-t}\cos(3t)$

2. Write the following functions in step function notation, where $u_a(t) = \begin{cases} 0 & t < a \\ a & t \geq a \end{cases}$

   (a)
   $$g(t) = \begin{cases} t-3 & t < 3 \\ 0 & t \geq 3 \end{cases}$$

   (b)
   $$g(t) = \begin{cases} t^2 & t < 1 \\ t^2 - 1 & 1 \leq t < 2 \\ t^2 - 2 & t \geq 3 \end{cases}$$

(c) $f(t)$ described by the following figure:



3. Using the Laplace Transform, solve the following initial value problem:

$$(D^2+1)x = \begin{cases} 0, & t < 2 \\ e^{-t}, & t \geq 2 \end{cases}; \quad x(0) = x'(0) = 0$$