Please staple this cover sheet in front of your answers. (Behind Department of Physics coversheet.)

NAME:

ID#:

ELEC441: Assignment 3 1pm Friday 26th March 2021

https://amoqt.otago.ac.nz/people/asbradley/elec441

- 1. Show, using test functions, that $f(t)\delta'(t) = f(0)\delta'(t) f'(0)\delta(t)$
- 2. Show that the derivative of the step response (i.e. the output when the input is u(t)) of a linear shift-invariant system is the impulse response.
- 3. Find the Fourier transform of (fg)*(hk) in terms of *F*, *G*, *H* and *K*.
- 4. Find the inverse Fourier transforms of:
 - (a) $\sin(2\pi\nu T)\cos(10\pi\nu T)/(\nu T)$
 - (b) $u(\nu 3)\exp(-\nu)$
- 5. The Volkswagen function v(x), shown below, has Fourier transform V(v).



For each of the following functions:

- Sketch the function.
- Give the Fourier transform in terms of $V(\nu)$
- State whether or not the Fourier transform is, real, imaginary, even, odd, Hermitian and anti-Hermitian. This is probably best presented as a table.

(a) v(2x)

- (b) v(x) + v(-x)
- (c) v(x) v(-x)
- (d) v(x+4)+v(x-4)

SCORE: