A. Find expressions for the following signal descriptions. For numbers 3-5 do not use conditional expressions – construct the expressions using combinations of other functions.

1. Sinusoidal signal with amplitude of 5, period of 2 sec, and having a maximum value at 1 sec.
2. Exponential decay with a time constant of 5 sec and a values of 20 at 10 sec and 10 at 20 sec.
3. A staircase function (unitless) that is:
   
   0, for t<0  
   1, for 0<t<1  
   2, for 1<t<2  
   3, for 2<t<3 …  

4. A sawtooth function that ramp up with a slope of 1 and resets to zero at every integer value.
5. Rectified cosine wave with amplitude of 4 and period of .01 sec (just the positive part).

B. Given \(g(t) = 5 \exp \left( at + 2 \right)\), find the following

1. Plot \(g(t)\) for \(a = 2, -2, 4j, -4j,\) and \(1+3j\) over the range \(-2<t<2\)
2. Find \(g((t-5)/2a)\)
3. Express \(g(2+g(t))\)
4. Express \(g(x + 3y)\)

C. Find the real and imaginary components as well as magnitude and phase of the following expressions.

1. \(2 \exp \left( 3 + j0.5 \right)\)
2. \((5+j3)/(10-j1)\)
3. \(4*(\exp(j2t) - j\exp(-j2t))\)
4. \(5*(\exp(j3t) - \exp(-j3t)\)

D. Rather than using the limit of a \(\text{rect}(t)\) function to generate the impulse function, consider using a function without discontinuities.

\[ g(t) = \frac{1}{1+t^2} \]

Come up with an expression for the unit impulse function using \(g(t)\) above with the appropriate scaling and limit. Show that the resulting expression meets the characteristics of the impulse.