1. a) Convolve \( x(t) = \left( \frac{1}{T_0} \right) \text{rect} \left( \frac{t}{T_0} \right) \) with \( h(t) = u(t) \frac{1}{RC} e^{-\frac{t}{RC}} \) to find the output \( y(t) \), for

a) \( T_0 = 0.05 \) and \( RC = 0.3 \) Plot the result.

b) \( T_0 = 1 \) and \( RC = 0.3 \) Plot the result.

Confirm your answer with Approximate Impulse Response @
http://www.ittc.ku.edu/~frost/EECS_360/Mathematica-360/Impulse_Examples.cdf

Also look at Convolution with a Rectangular Pulse @
http://demonstrations.wolfram.com/ConvolutionWithARectangularPulse/

c) Is the result from part a) close to \( h(t) \), why?

d) Convolve \( x(t) = \left( \frac{1}{T_0} \right) \text{rect} \left( \frac{t}{T_0} \right) \) with \( h(t) = u(t-1) \frac{1}{RC} e^{-\frac{t}{RC}} \) for \( T_0 = 1 \) and \( RC = 0.3 \) Plot the result.

e) What is the relationship between the results in parts b) and d) above?

2. Convolve \( h[n] = .1(u[n] - u[n-10]) \) with \( x[n] = u[n] - u[n-10] \) Plot the result.

Confirm your answers with Discrete-Time Convolution. @
http://demonstrations.wolfram.com/DiscreteTimeConvolution/

3. Let \( x[n] = 0, 1, 2 \) for \( n = 1, 2, 1 \) and \( h[n] = 3, 2, 1 \) for \( n = 0, 1, 2 \). Convolve \( x(n) \) with \( h(n) \) and plot the result. Confirm your answer with Convolution Sum. @
http://demonstrations.wolfram.com/ConvolutionSum/

4. The system input, \( x(t) = \frac{u(t-1)\exp(-(-t-.5))}{\exp(-.5)} + \text{rect}(t-.5) \) and impulse response, \( h(t) = \text{rect}(t-.5) \), are given below. Find the system output. Hint: Use linearity and time invariance.