Include answers for Problems and include MATLAB coding along with any output plots that support solutions

1. **The input-output equation characterizing an amplifier that saturates once the input reaches certain values is:**



**Where x(t) is the input and y(t) the output**.

1. Plot the relation between the input x(t) and the output y(t). Is this a linear system? For what range of input values is the system linear, if any?
2. Suppose the input is a sinusoid x(t) = 20 cos(2t)u(t), carefully plot x(t) and y(t) for t = -2 to 4.
3. **The following op-amp circuit is used to measure the changes of temperature in a system. The output voltage is given by:**



**Suppose that the temperature in the system changes cyclically after t = 0, so that:**



**Let the input be Vi(t) = 1 volt.**

1. If the switch closes at t0 = 0 msec., plot the output voltage V01(t) for 0≤t≤0.2 sec. in time-intervals of 0.01 sec.
2. If the switch closes at t0 = 50 msec., plot the output voltage V01(t) for 0≤t≤0.2 sec. in time-intervals of 0.01 sec.
3. **A zener diode is such that the output corresponding to an input Vs(t) = cos(t) is a “clipped” sinusoid**



**Use MATLAB to generate the input and output signals and plot them in the same plot for 0≤t≤4 at time intervals of 0.001.**

1. Is this system linear? Compare the output obtained from Vs(t) with that obtained from 0.3 Vs(t).