ECE 3355 – ELECTRONICS

HOMEWORK #3

1. Find the transfer function ***Vout /Vin*** for the following circuits.

a) 

b) 

c) 

2. a) Find the transfer function ***Vout /Vin*** for the circuit shown in Figure 2.

b) By proper choice of the components *R1*, *C1*, *R2*, and *C2*, the transfer function of this circuit can be made independent of frequency. In that case the circuit is called a *compensated attenuator*, and can be used as an oscilloscope probe. In this application, the signal from a circuit being viewed on an oscilloscope is attenuated, and the input impedance of the oscilloscope is “compensated” by the probe so that it does not distort the measurement. Assume that in Figure 2, *R1* and *C1* represent the probe, while *R2* and *C2* represent the oscilloscope input. For an oscilloscope with an input of 1[M] and 30[pF], design a 10:1 probe, that is, a probe that attenuates the signal by a factor of 10.

Figure 2

1. An amplifier has a transfer characteristic that can be reasonably approximated by the following set of expressions:



a) Sketch this transfer characteristic.

b) Assume that *VS* = 10.5[V] and *vs* = 0.3 sin(60[rad/s]*t*)[V] in Figure 3. For this signal level and dc bias value, what is the gain, *Av*, where



c) Again, assume that *VS* = 10.5[V] and *vs* = 0.3 sin(60[rad/s]*t*)[V] in Figure 3. Find an expression for *io(t)*.

d) Again, assume that *VS* = 10.5[V] in Figure 3.What are the largest values for *vs* that will yield an undistorted output?

Figure 3