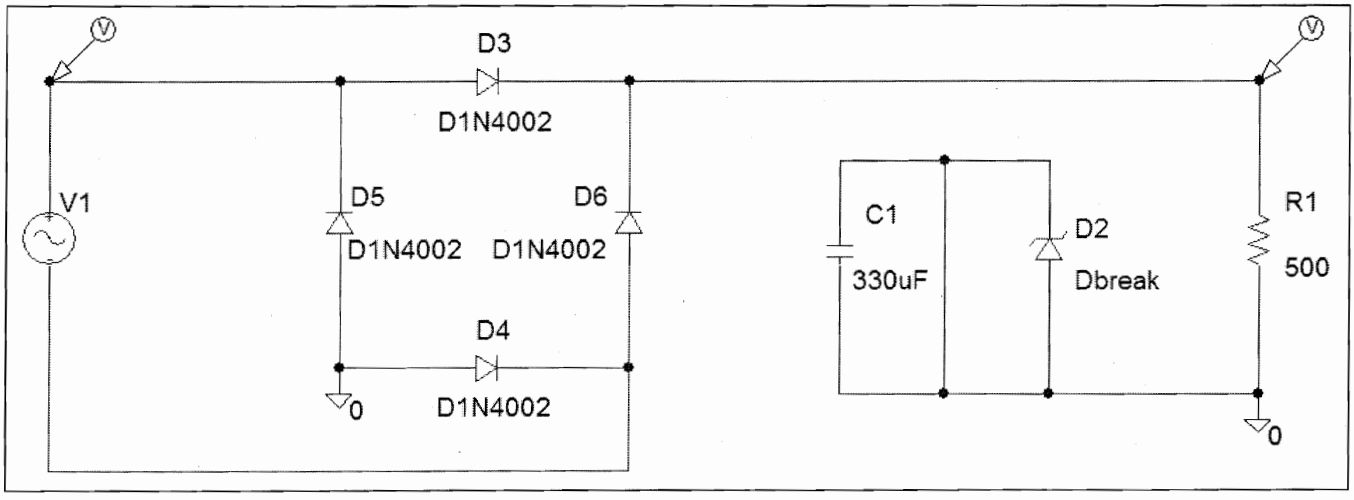
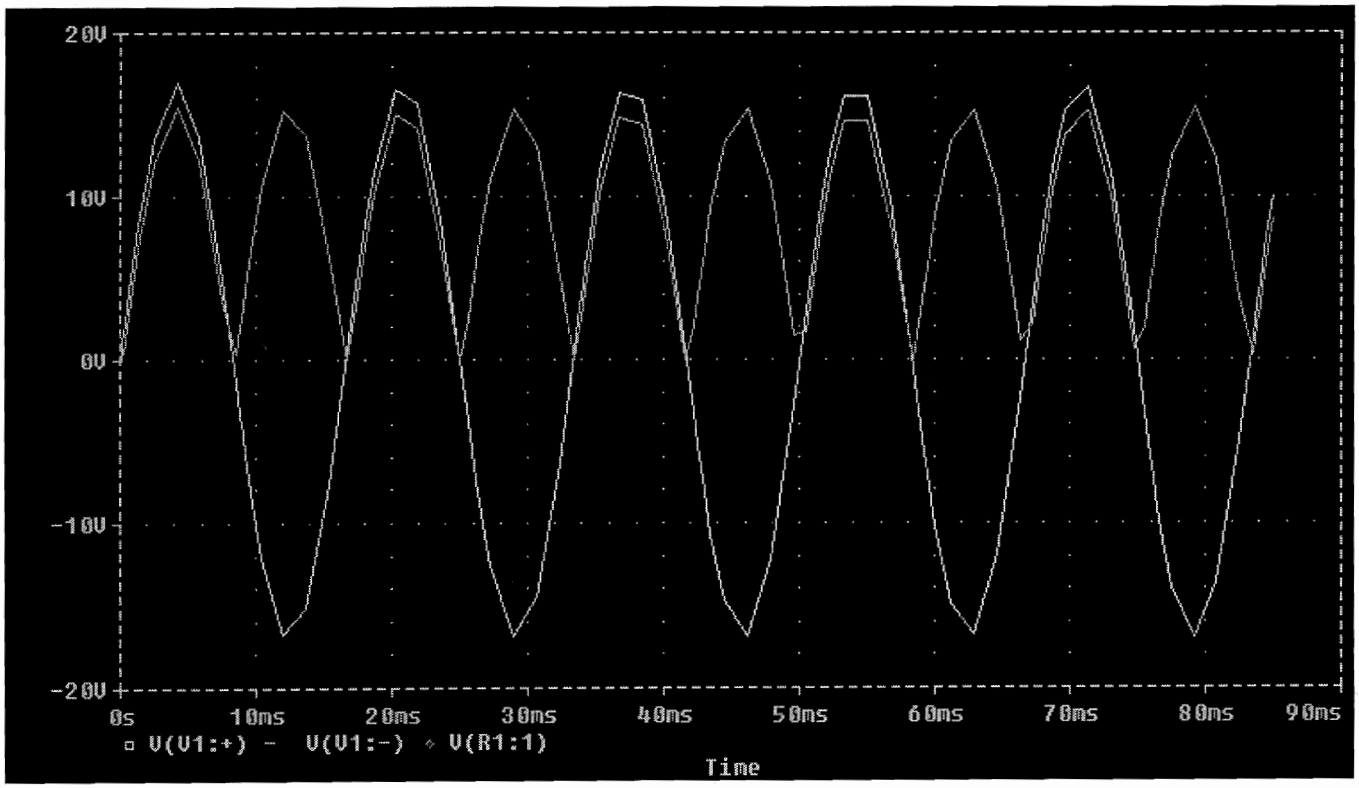
NOTES ON LAB 02

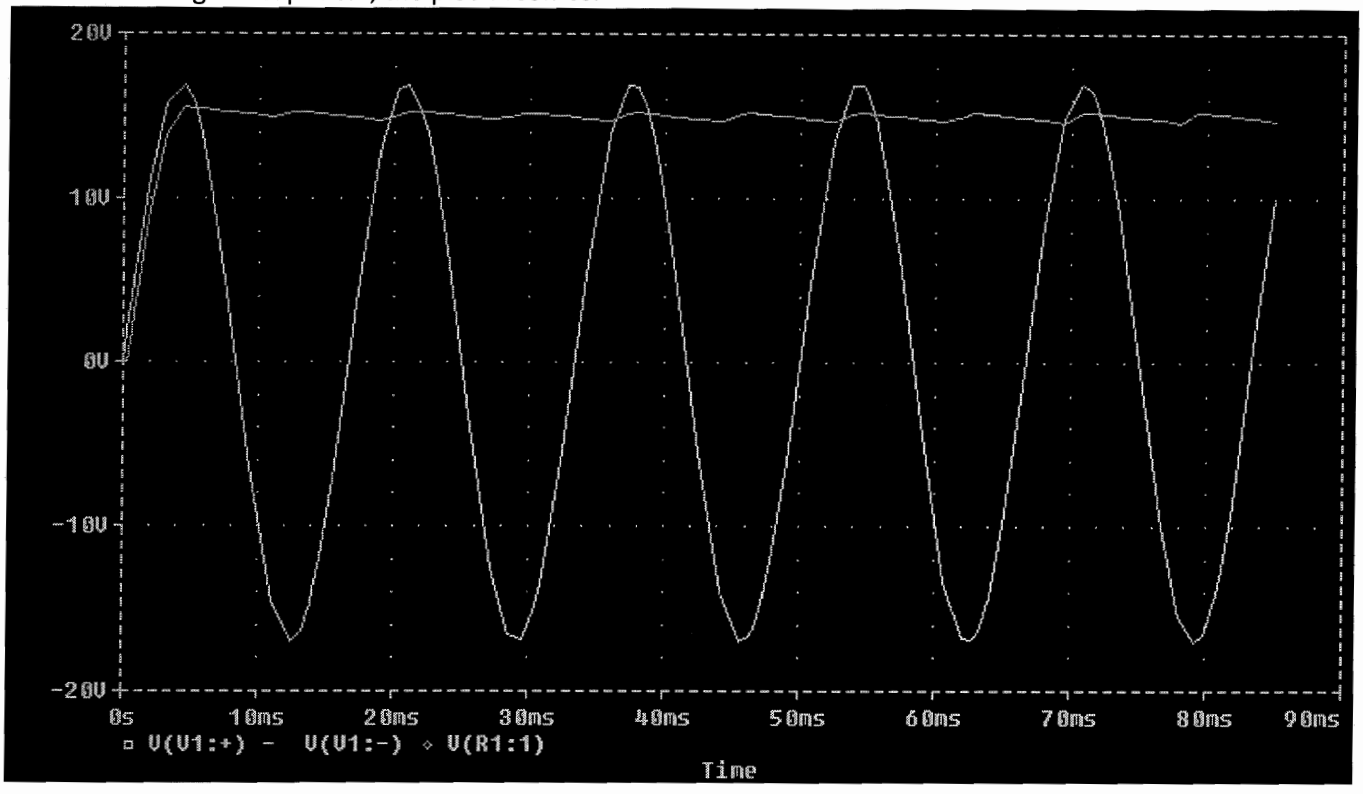
Here's the circuit:



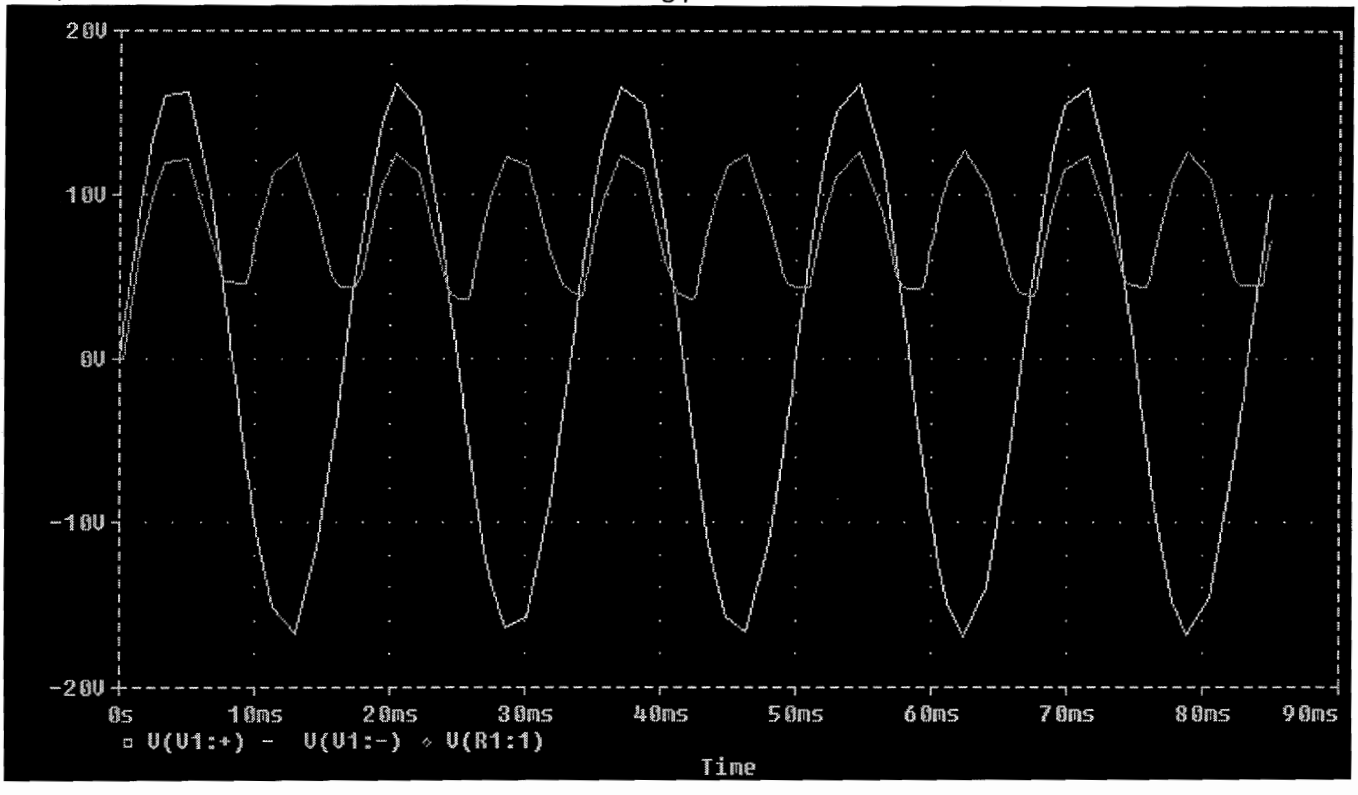
Here's the plot with just the load connected:



After connecting the capacitor, the plot becomes:



Now, let's connect the Zener diode. Here's the resulting plot:



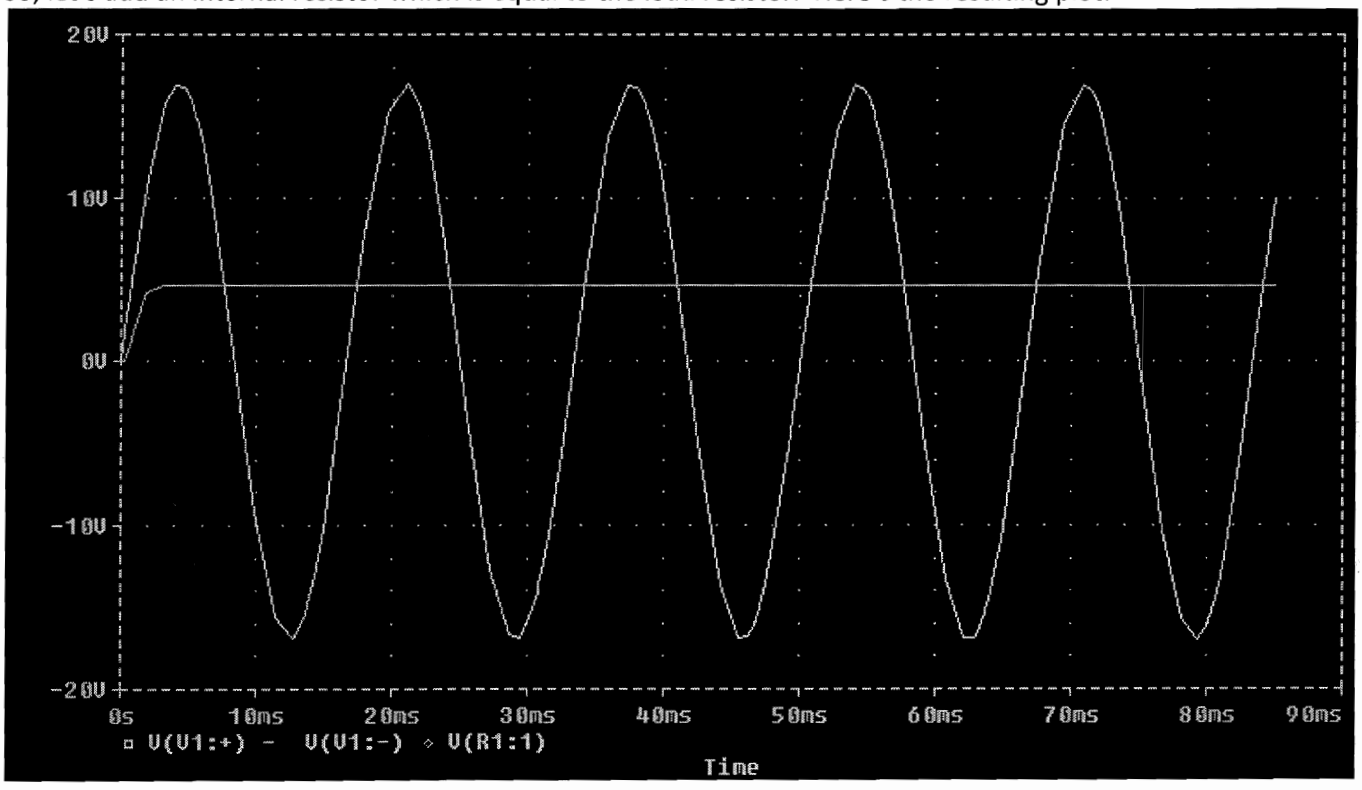
QUESTION: Why do we get a sinusoidal output now?

ANSWER: Because we are overloading the Zener diode. It cannot handle as much current as we are trying to shove through it. In the real world, it would burn up! In PSPICE, the excess current spills over to the load and appears as a sine wave. So, this illustrates a case where PSPICE does not show what really happens.

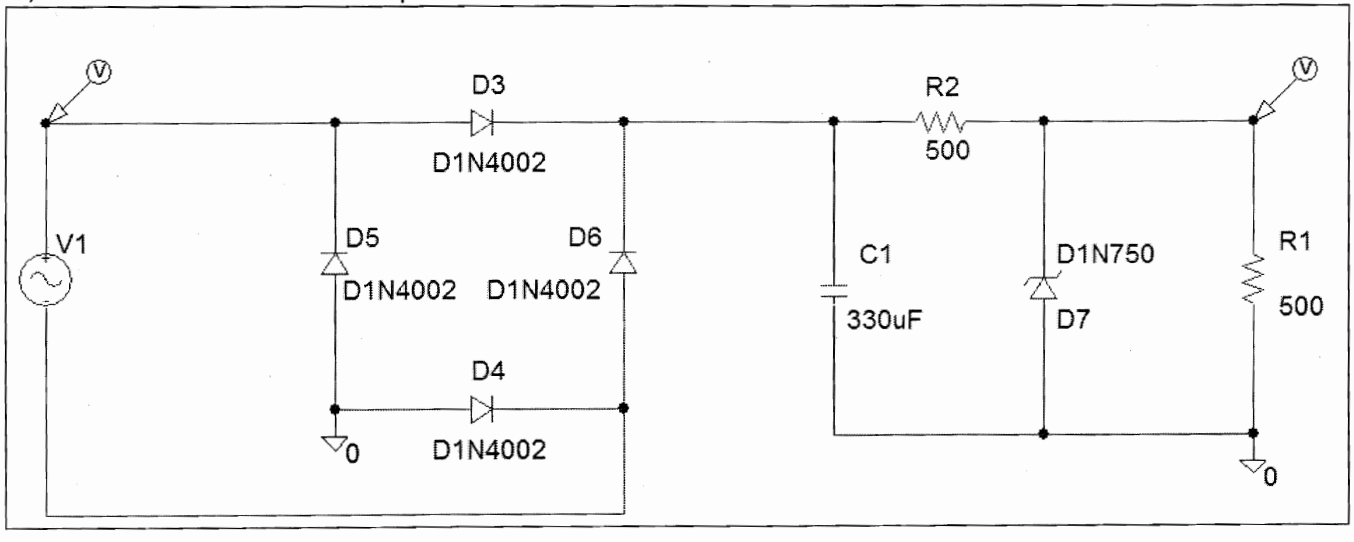
QUESTION: So, what's the solution?
ANSWER: As with LEDs, add a resistor to limit the current to the diode.
PROBLEM: Now the added resistor, which is inside the power supply, uses up energy and gives off heat. That's one reason why power supplies give off a lot of heat. But, we don't have a choice, if we want to get a nice, flat DC voltage.

QUESTION: What value of resistor should we use?
ANSWER: Remember the maximum power transfer theorem? If the internal resistor is equal to the load, then the load will get the most power possible.

So, let's add an internal resistor which is equal to the load resistor. Here's the resulting plot:

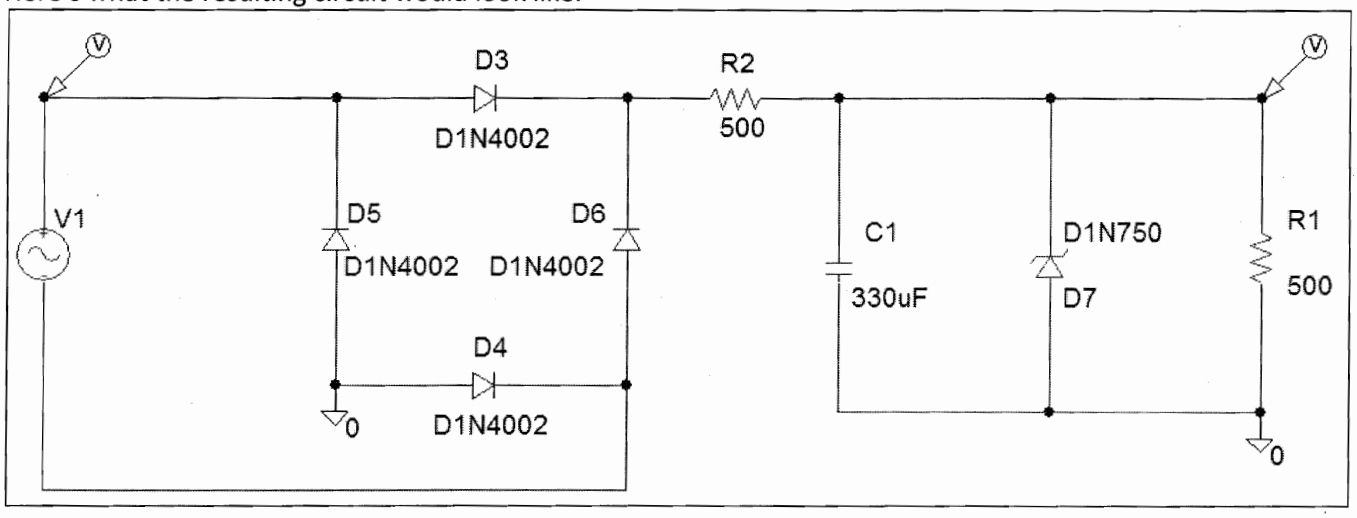


So, now we have a nice 5 Vdc output. The final circuit is shown below:

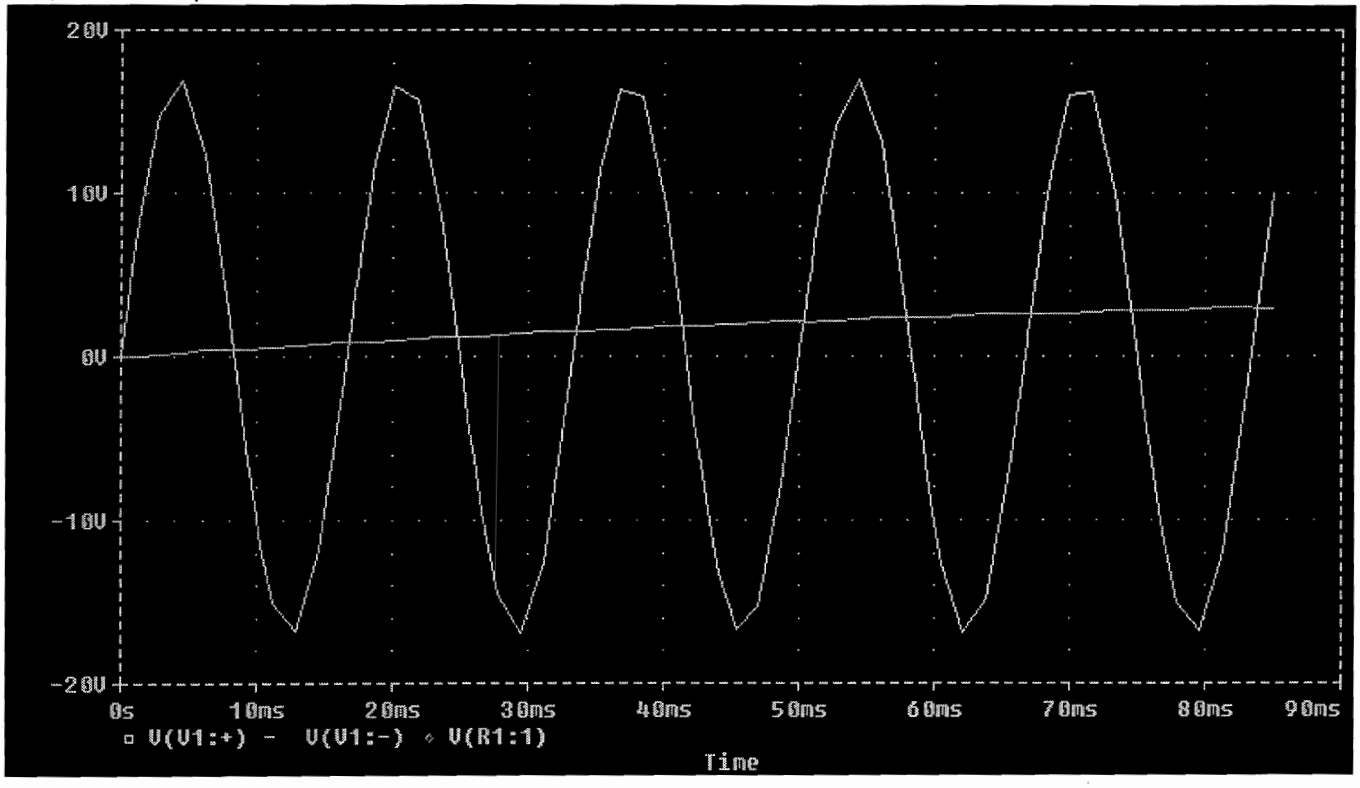


What if we placed the internal resistor in front of the capacitor? How would this change the output?

Here's what the resulting circuit would look like:



And, here's the plot:



QUESTION: Where should we place the internal resistor, and why?

CONCLUSIONS: This illustrates the design process - -
First, you assemble a theoretical circuit and analyze it.
Then, you solve any problems that appear and try various ways to correct them.