PHY 440 homework problem T3:

1. Derive the following transfer function expression for the circuit of Figure E:

$$\frac{v_o}{v_s} = \frac{R_2}{R_2 + R_1(1 + j\omega C R_2)}$$
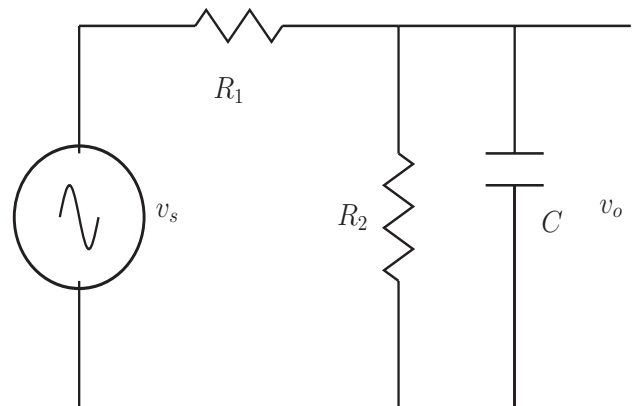

Figure E: Circuit for problem T3.

2. The circuit in Figure E is representative of a real-life capacitor, which is an ideal capacitor in parallel with large resistor. Show that if $R_2 \gg R_1$, then terms of order R_1/R_2 can be neglected and the gain reduces to the simple low-pass filter gain:

$$\left|\frac{v_o}{v_s}\right| = \frac{1}{\sqrt{1 + \omega^2 R_1^2 C^2}}$$