Voltage Amplifier

\[ \tilde{v}_s(t) = \Delta E \sin \omega t \]
\[ v_o(t) = E_Q + \tilde{v}_o(t) \]

Small-signal Equivalent Circuit

\[ \tilde{v}_o(t) = \frac{R_s}{R + R_s} \tilde{v}_s(t) \]

Example: 
\[ R = 0.5K \]
\[ R_s = -1.0K \]
\[ \tilde{v}_o(t) = \frac{-10^3}{(0.5 - 1.0)10^3} \tilde{v}_s(t) \]
\[ = \frac{-1.0}{-0.5} \tilde{v}_s(t) = 2 \tilde{v}_s(t) \]

We have a small-signal voltage amplifier with a voltage gain 
\[ G \triangleq \frac{v_o}{\tilde{v}_s} = 2. \]