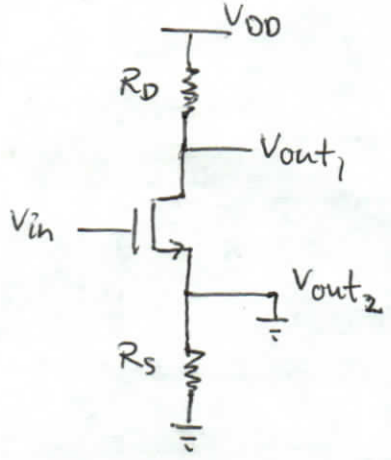
3.32 Prove $\frac{V_{out_1}}{V_{out_2}} = \frac{-R_D}{R_S}$ → use superposition!

Find V_{out_1}:

[V_{out_2} is grounded]



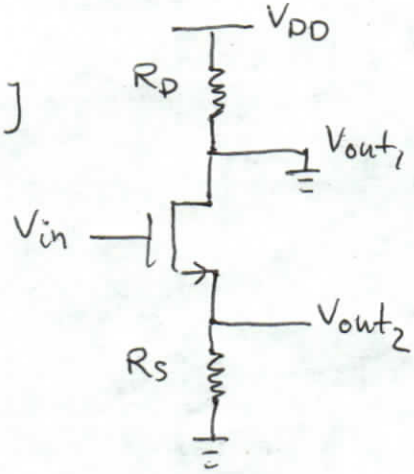
V_{out_1} sees common-source with resistive load

$V_{out_1} = -G_m R_D$

$V_{out_2} = 0$

Find V_{out_2}:

[V_{out_1} is grounded]



V_{out_1} sees common-source with source degeneration

V_{out_2} sees common-drain (source-follow)

$V_{out_1} = G_M = \frac{g_m}{1 + g_m R_S} \approx \frac{1}{R_S}$

$V_{out_2} = 1$

Combine equations:

$V_{out_1} = \frac{-R_D}{R_S}$, $V_{out_2} = 1$

Thus $\frac{V_{out_1}}{V_{out_2}} = \frac{-R_D/R_S}{1} = \frac{-R_D}{R_S}$