## Quiz for Lesson 31 and 32

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## Prob. 1

Determine the small-signal voltage gain of the following CS with degeneration amplifier. Assume both transistors are in saturation. $\mathrm{M}_{1}$ has transconductance of $\mathrm{g}_{\mathrm{m} 1}$ and $\lambda_{1}=0 . \mathrm{M}_{2}$ has transconductance of $\mathrm{g}_{\mathrm{m} 2}$ and $\lambda_{2}=0$.


## Prob. 2

Now, assume $M_{1}$ has $\lambda_{1}=0$ but $M_{2}$ has $\lambda_{2}>0$ with $r_{02}$. Determine the small-signal voltage gain of the circuit shown above.

## Prob. 3

Now, assume $M_{1}$ has $\lambda_{1}>0$ with $r_{02}$ and $M_{2}$ has $\lambda_{2}>0$ with ro2. Determine the output resistance for the circuit shown in Prob. 1.

## Prob. 4

Consider the CG amplifier shown below where $\mathrm{V}_{\mathrm{DD}}=3 \mathrm{~V}, \mathrm{R}_{\mathrm{D}}=1 \mathrm{k} \Omega, \mathrm{R}_{3}=500 \Omega, \mathrm{R}_{\mathrm{s}}=10 \Omega$, $M_{1}$ has $u_{n} C_{0 x}=100 \mu A / V^{2}, W / L=20, V_{T H}=0.5 V, \lambda=0$. Select values for $R_{1}$ and $R_{2}$ so that the bias drain current is 1 mA .


## Prob. 5

What is the numerical value for the input resistance seen to the right of node $X$ ?

## Prob. 6

What is the numerical value for the small-signal voltage gain?

