1. What collector current is required for a bipolar transistor to achieve a transconductance of 25 mS?

2. What is the collector bias current, $I_C$ which yields $r_n = 5 \, \text{k}\Omega$ for a bipolar transistor with $\beta = 125$? What are the approximate values of $g_m$ and $r_o$ if $V_A = 100 \, \text{V}$?

3. A circuit requires the use of a transistor with a transconductance of 250 mS. A bipolar transistor with $\beta_{DC} = 100$ and a MOSFET with $K_n = 25 \, \text{mA/V}^2$ are available. Which transistor would be preferred and why?

4. Sedra & Smith, Problem 7.92

5. Sedra & Smith, Problem 7.94

6. The circuit in Figure PS7.1 below illustrates a simple biasing method where a large feedback resistor, $R_G$ connects the drain and gate of an NMOS transistor. If $V_{DD} = 3 \, \text{V}$, $k' = 25 \, \mu\text{A/V}^2$, $V_m = 0.7 \, \text{V}$, and $R_G = 1 \, \text{M}\Omega$, design the circuit below to have a bias current $I_D$ of 500 $\mu\text{A}$. Pick a standard 5% resistor value for $R_D$, and find the actual current $I_D$ and the drain voltage $V_D$.

![Figure PS7.1](image-url)
7. Sedra & Smith, Problem 7.108
8. Sedra & Smith, Problem 7.24
9. Sedra & Smith, Problem 7.33