We Can Make an Op-Amp from Our Pieces

• Already have differential input and 0 output impedance (for large vO)
• Need infinite gain and DC coupling (use level shifts to achieve that)
• Input common mode range (b/c feedback shrinks DM, rail-to-rail)
• Input bias current
• Input offset voltage
• Output swing (rail-to-rail)
• Mirror biasing is handy
Compensation Capacitance and Slew Rate

- Op-amps always in feedback (why we care about input CM range)
- If you hear feedback, always think stability $\rightarrow$ CC makes look 1$^{st}$ order
- But big caps limit $dV/dt$ at op-amp output, called slew rate

\[ SR = \frac{I_{out}}{C_L} \]
\[ SR_{cc, mirror} = \frac{I_{tail}}{C_C} \]
\[ SR_{cc, resistor} = \frac{I_{tail}}{2C_C} \]