Real operational amplifiers produce an output voltage even when the input voltages are equal (c.f. Diefenderfer and Holton Sec. 9.10) The output voltage in the open-loop configuration shown below may be described in terms of the equation:

\[ V_{out} = A(V_+ - V_-) + \frac{A}{CMRR}(V_+ + V_-) \]

CMRR is the Common Mode Rejection Ratio. Given CMR = 20\log_{10}(CMRR) = 90 \text{ dB} and open-loop gain of \( A = 2 \times 10^5 \) for the 741 op-amp (Diefenderfer and Holton p. D-70), find \( V_{out} \) for the differential amplifier shown if \( V_1 = 9 \text{ V}, V_2 = 9.02 \text{ V}, R = 1\Omega \) and \( R_F = 120 \text{ k}\Omega \). How is \( V_{out} \) different from the output for an ideal operational amplifier?