Problem 1.

For the following circuit:
Calculate the voltages $V_N$, $V_P$ and $V_O$

Problem 2.

For these circuits calculate the gain and the input resistance seen by the input signal $V_i$. Assume ideal op-amps.
Problem 3.

Calculate the gain $A = \frac{V_o}{V_i}$ for the following ideal op-amp circuit

![Circuit Diagram]

Problem 4.

The op-amp in the following circuit outputs a current of 5 mA. ($I_o = 5$ mA). The transistor has $\beta = 100$. Calculate the value of the resistor $R$.

![Circuit Diagram]

Problem 5.

The following circuit is a high pass filter.

1. Derive the voltage transfer function $V_o / V_i$
2. What is the voltage gain at low and at high frequencies?
3. At what frequency is the magnitude of the gain $1/\sqrt{2}$ of the maximum value?

![Circuit Diagram]