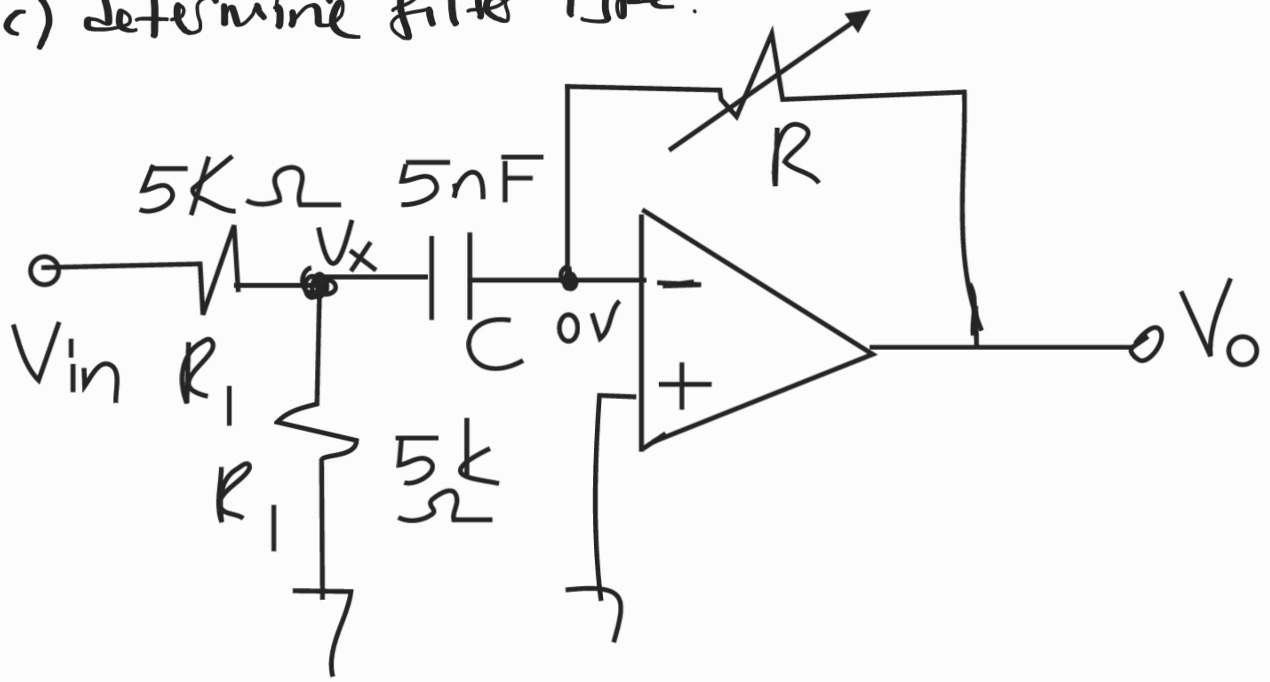
a) obtain transfer function in s-domain and frequency domain b) compute w_c
c) determine filter type.



$$\frac{V_x}{\frac{1}{SC}} + \frac{V_x - V_{in}}{R_1} + \frac{V_x}{R_1} = 0 \; ; \; V_x = \frac{V_{in}}{(SCR_1+2)}$$

$$\frac{0 - V_x}{\frac{1}{SC}} + \frac{0 - V_o}{R} = 0$$

$$V_o = -SRCV_x = \frac{-SRC\,V_{in}}{(SCR_1+2)}$$

$$H(s) = \frac{V_o(S)}{V_{in}(S)} = \frac{-S\,R/R_1}{S + \frac{2}{CR_1}}$$

$$H(s) = \frac{-SR}{(S + 8\times10^4)\,5\times10^3}$$

$$H(j\omega) = \frac{-j\omega R\, 2\times10^{-4}}{j\omega + 8\times10^{4}}$$

$$|H(j\omega)| = \frac{\omega R\, 2\times10^{-4}}{\sqrt{\omega^2 + 64\times10^{8}}}$$

a) R controls only gain.
It doesn't have effect on w_c.

b) $$|H(jw_c)| = \frac{+w_c R\, 2\times10^{-4}}{\sqrt{w_c^2 + 64\times10^{8}}}$$

$$|H(j\infty)| = \frac{w_c R\, 2\times10^{-4}}{\sqrt{1 + \frac{64\times10^{8}}{w_c^2}}\; w_c}$$

$$H_{max} = |H(j\infty)| = 2\times10^{-4} R$$

To find w_c, establish the following eqn.

$$\frac{w_c R\, 2\times10^{-4}}{\sqrt{w_c^2 + 64\times10^{8}}} = \frac{2\times10^{-4} R}{\sqrt{2}}$$

$$w_c^2 + 64\times10^{8} = 2w_c^2$$

$$w_c = \sqrt{64\times10^{8}} = 8\times10^{4}\ r/s$$

c) $|H(j0)| = 0$

$$|H(j\infty)| = 2\times10^{-4} R$$

high pass filter