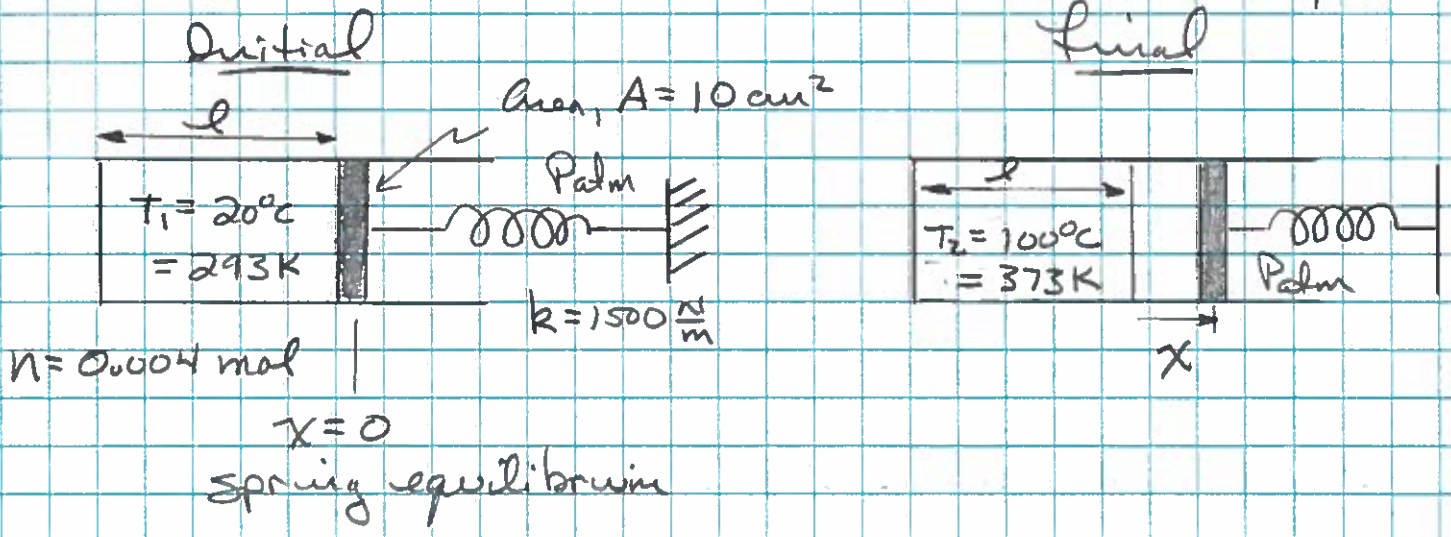
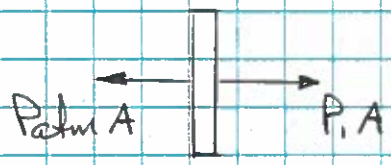


first, we have to find ℓ, the length of the cylinder.

FBD of piston at initial position.

$$\Sigma F_x = P_1 A - P_{atm} A = 0 \Rightarrow P_1 = P_{atm}$$



Now, $PV = nRT \Rightarrow V_1 = \frac{nRT_1}{P_1} = 9.61 \times 10^{-5}\ m^3$

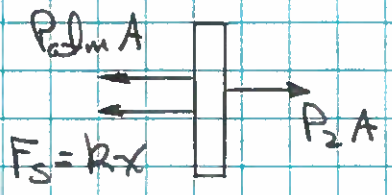
and, $V_1 = A\ell \Rightarrow \ell = \frac{V_1}{A} = 9.61 \times 10^{-2}\ m$

Now, for final state: $T_2 = 373\ K$

$V_2 = A(\ell + x)$

and, $PV = nRT \Rightarrow P_2 = \frac{nRT_2}{V_2} = \frac{nRT_2}{A(\ell+x)}$

Now, FBD at final:



$$\Sigma F_x = P_2A - P_{atm}A - kx = 0$$

So, use P_2 from above:

$$\frac{nRT_2}{A(l+x)}A - P_{atm}A - kx = 0$$

or,

$$nRT_2 - P_{atm}A(l+x) - kx(l+x) = 0$$

or,

$$kx^2 + (kl + P_{atm}A)x + (P_{atm}Al - nRT_2) = 0$$

Putting in the numbers:

$$1500x^2 + 245.4x - 2.664 = 0$$

Quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= -8.18 \times 10^{-2} \pm 9.202 \times 10^{-2}$$

$$\therefore \boxed{x = 1.022 \times 10^{-2}\,m = 1.022\,cm}$$