HW1, PP1

A can is in the fridge at an initial temperature of $T_i=20C$

The fridge is at $T_\infty=2C$ and the final temperature of the can is $T=6C$

Energy balance:

The rate of change in internal energy of the can is
$q=m c_p dT/dt$

The rate of heat transfer from the surface of the can is (Newton's law of cooling)
$q=hA_s(T_s-T_\infty)$

Where A_s is the surface area of the can, h is the convective heat transfer coefficient and T_s is the surface temperature. In this problem we can assume that the can is in a uniform temperature. Hence, we get the following by combining the two expressions for the rate of heat transfer:

$mc_p dT/dt=h A_s(T-T_\infty)$

The rest is mathematics...

HW1, PP2

Conduction along a copper wire.

The heat equation in 1d is
$\partial T/\partial t=\alpha \partial^2 T/\partial x^2$

Since we are at steady state, the time derivative is zero, and we obtain
$\partial^2 T/\partial x^2=0$

The rest is mathematics…

For part b, use Fourier's law
$q=-kA\, dT/dx$