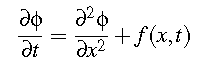
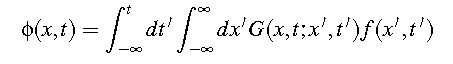
The causal solution of the one-dimensional diffusion equation with source term *f*



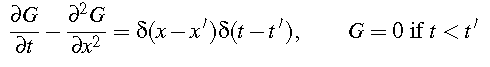
(1)

is given by



(2)

where is the causal Green function satisfying



(3)

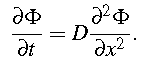
a) Change variables in (3) to , . Letting with the Heaviside step function[[1]](#footnote-1), show (3) is solved if satisfies



(4)

Solve by Fourier transforming with respect to the position variable. Hence obtain an expression for

b) The temperature of a long uniform insulating metal rod satisfies



A heating element is used to create an initial temperature distribution Writing obtain an equation for , and combining (1), (2) and the answer to a) identify the temperature variation at the center of the rod, .

1. for , =1/2 for and for and satisfies [↑](#footnote-ref-1)