Homework I

1. Put a potato into an oven. The temperature of the potato at is and it will heat up. Denote the temperature at as . The temperature of the oven is a constant

Newton has a law stating that the heat transfer from oven to potato (proportional to the change of per unit time is proportional to the temperature difference . Therefore, we can write down an equation (for positive ):

Solve .

Sol: Collect factors of on the left hand side and factors of on the right hand side:

Keep the denominator positive. Integrate and add a constant :

The constant can be obtained by the initial condition: : .

1. Arfken Exercise 7.2.3

Sol:

Collect factors of on the left hand side and factors of on the right hand side:

Integrate and add a constant :

The constant can be obtained by the initial condition:

1. The function satisfies

Solve .

Sol: Collect factors of on the left hand side and factors of on the right hand side:

Integrate and add a constant :

The constant can be obtained by the initial condition : .

1. Solve the equation of

Sol: The integrating factor would be

Multiply the whole equation by the integrating factor :

Integrate and add a constant :

The constant can be obtained by the initial condition : .