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Subject: Numerical Methods

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PROJECT MATLAB

Question 1

$$\frac{\partial T}{\partial t} = \frac{T_i^{n+1} - T_i^n}{\Delta t}$$

Question 2

$$\alpha \frac{\partial^2 T}{\partial x^2} = \alpha \frac{T_{i+1}^n - 2T_i^n + T_{i-1}^n}{(\Delta x)^2}$$

Question 3

$$\frac{T_i^{n+1} - T_i^n}{\Delta t} = \alpha \frac{T_{i+1}^n - 2T_i^n + T_{i-1}^n}{(\Delta x)^2}$$

Question 4

$$T_i^{n+1} = T_i^n + \alpha\Delta + \frac{(T_{i+1}^n - 2T_i^n + T_{i-1}^n)}{(\Delta x)^2}$$

Question 5

a) $x = 0 \rightarrow T_g = T_0^n$

b) $x = L \rightarrow T_d = T_L^n$

c) $z = 0 \rightarrow T_x^0 = T_0$

Question 6&7

```
PrjMatlab.m ×    +
/MATLAB Drive/PrjMatlab.m
1      clear all;
2      clc;
3      L = 0.4;
4      n = 40;
5      dx = 0.01;
6      dt = 0.5;
7      Tg = 100;
8      Td = 50;
9      T0 = 0;
10     Cp = 900;
11     lambda = 237;
12     p = 2700;
13     a = lambda / (Cp * p);
14
15     T = zeros(n+1, 1);
16     T(1) = Tg;
17     T(n+1) = Td;
18
19     steps = 1000;
20     time = 0:dt:dt*steps;
```

Figure 1 ×   Figure 2 ×   +

Evolution of the temperature in bar


```
PrjMatlab.m ×    +
/MATLAB Drive/PrjMatlab.m
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5      dx = 0.01;
6      dt = 0.5;
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12     p = 2700;
13     a = lambda / (Cp * p);
14
15     T = zeros(n+1, 1);
16     T(1) = Tg;
17     T(n+1) = Td;
18
19     steps = 1000;
20     time = 0:dt:dt*steps;
```

Figure 1 ×   Figure 2 ×   +

Temperature at Middle Point