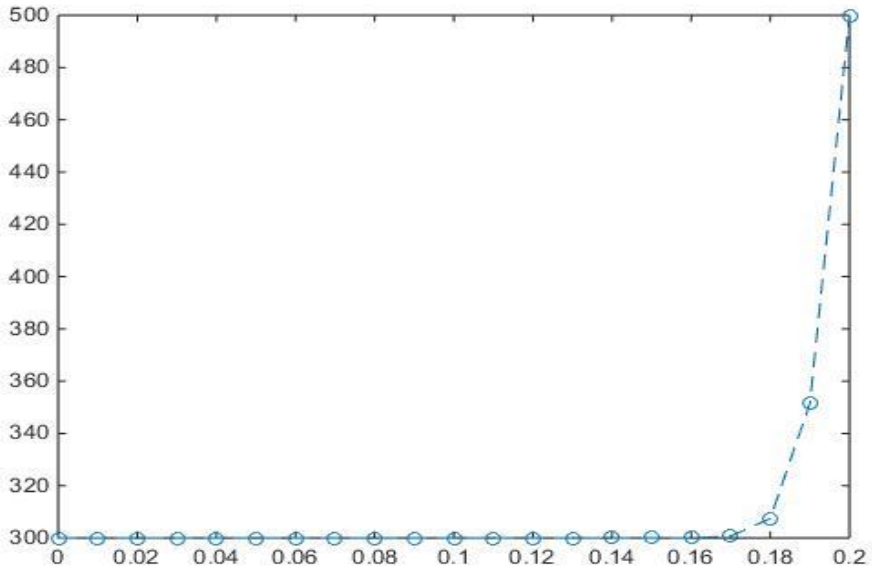
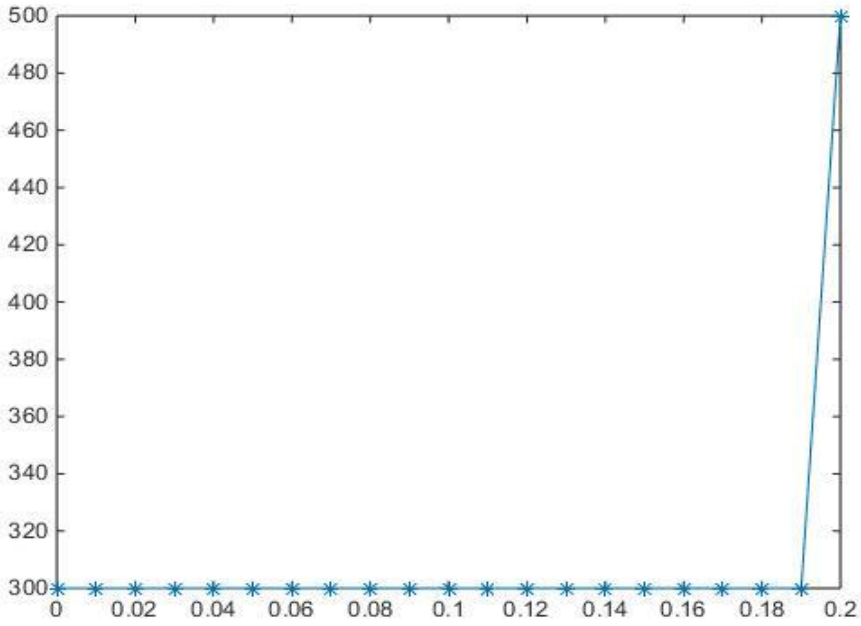
Assignment 8

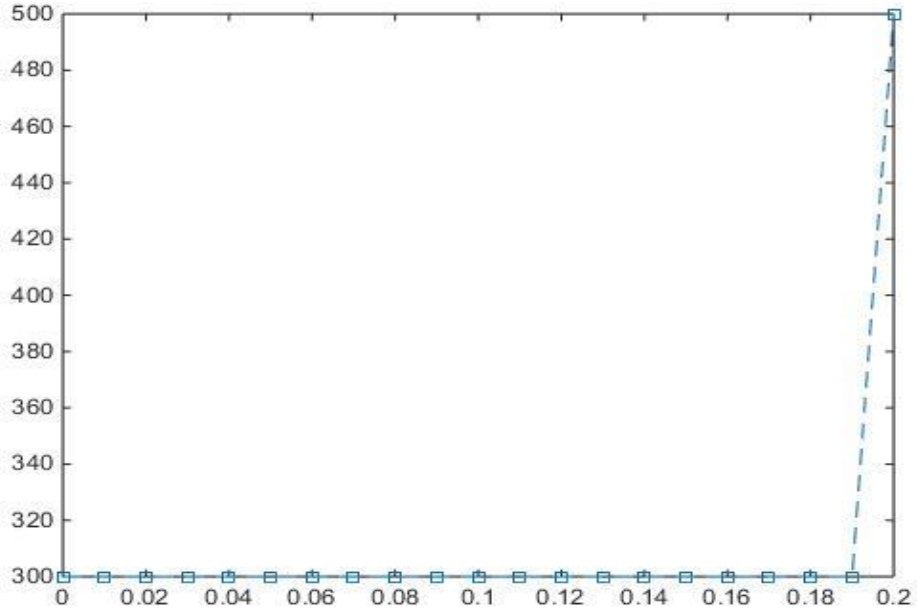
120100093

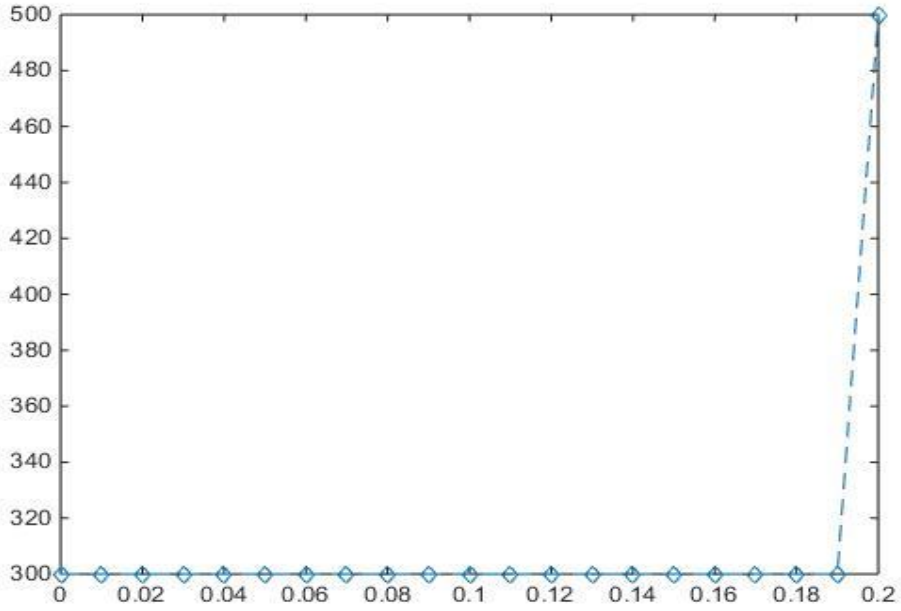
dt = 1 and dy = .01

First Boundary Condition



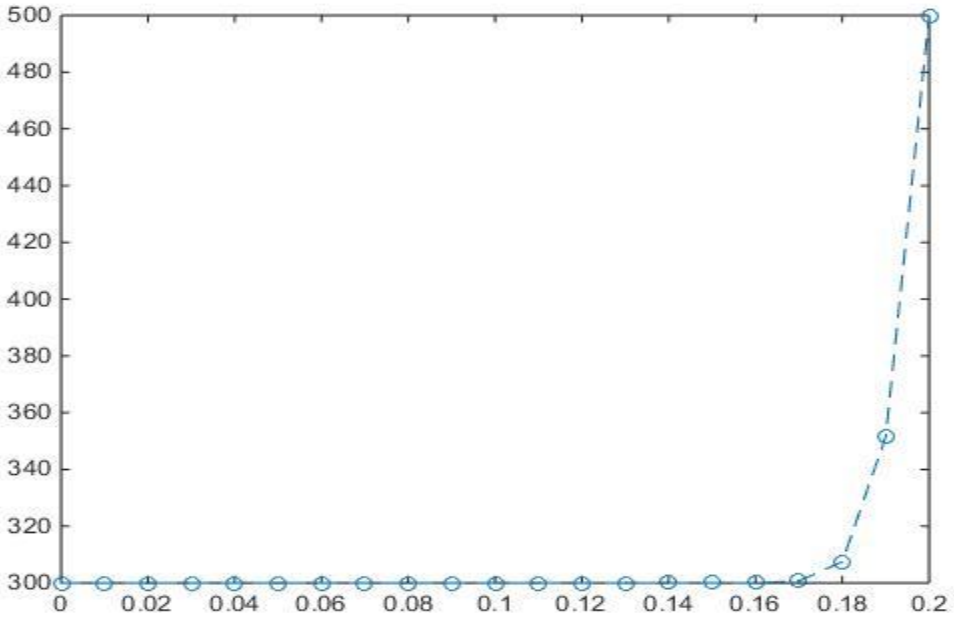


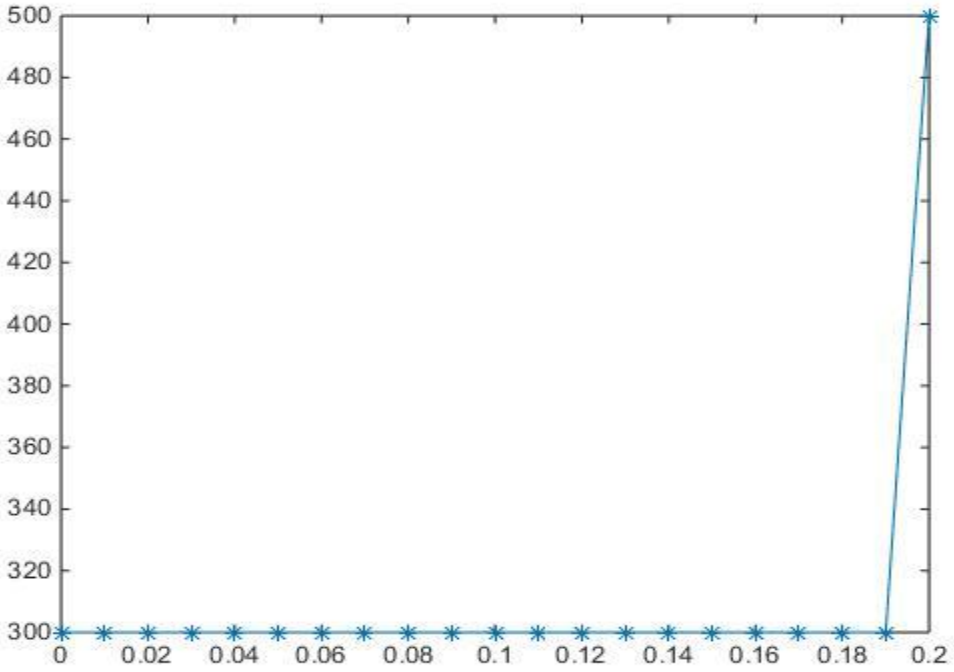


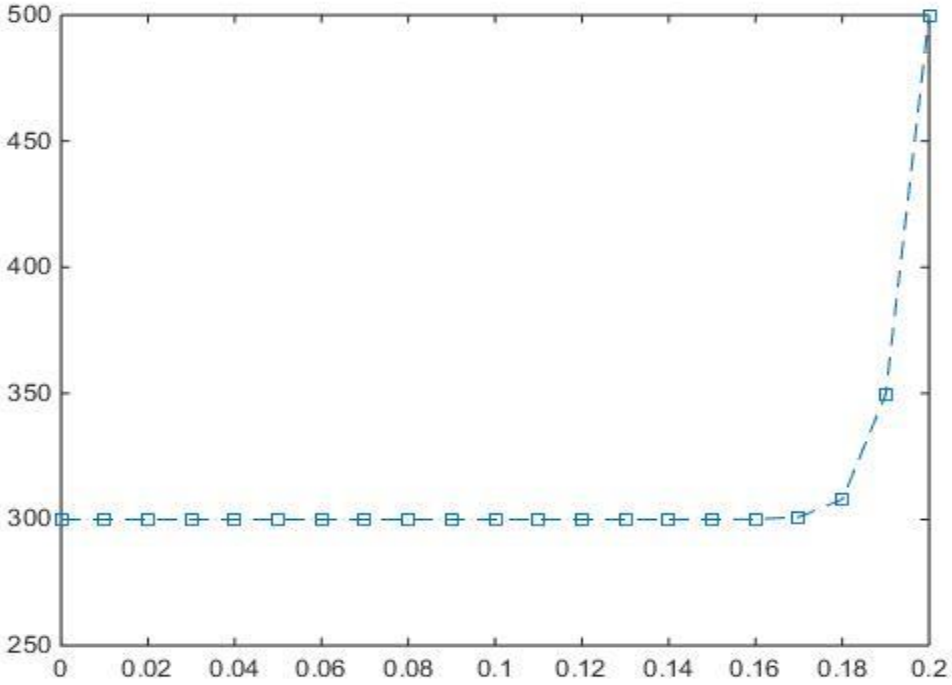


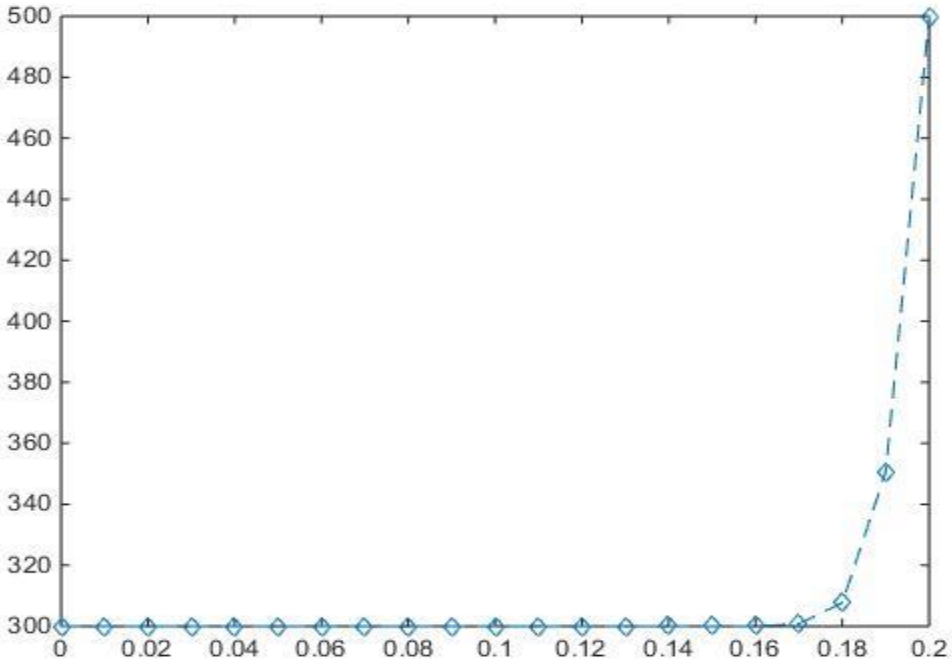
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second Boundary Condition





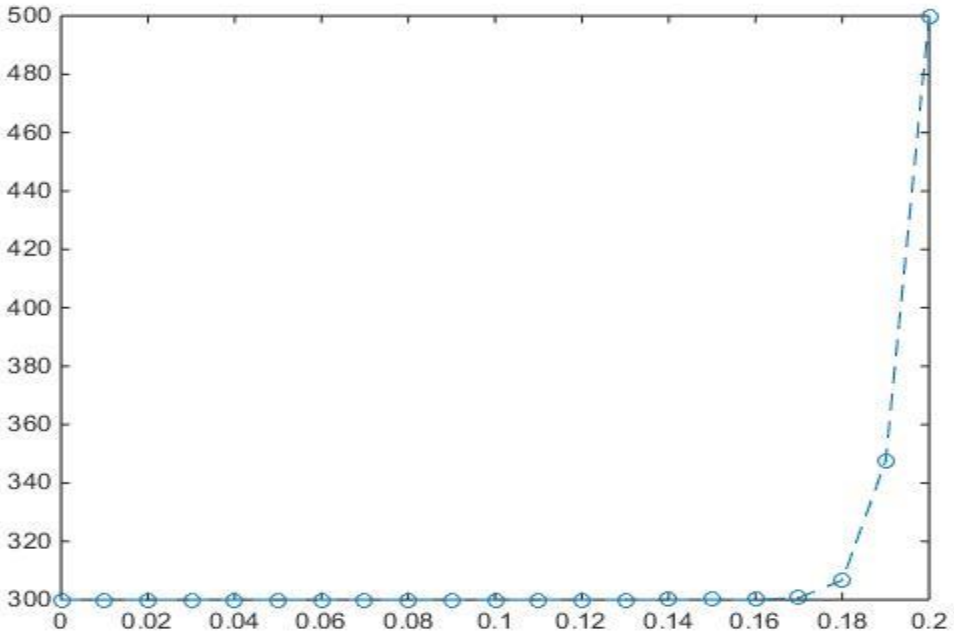


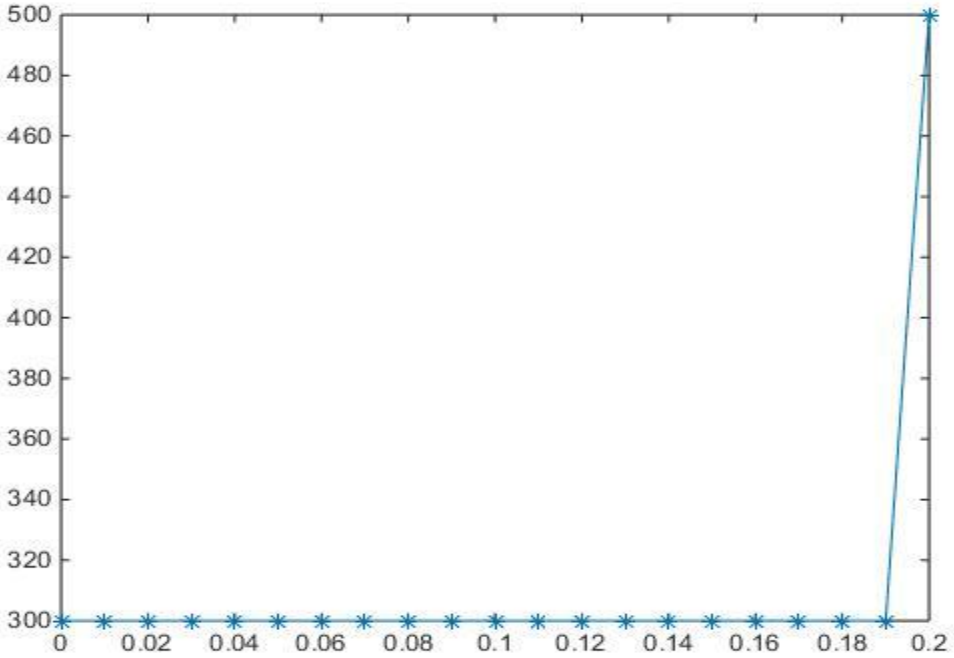


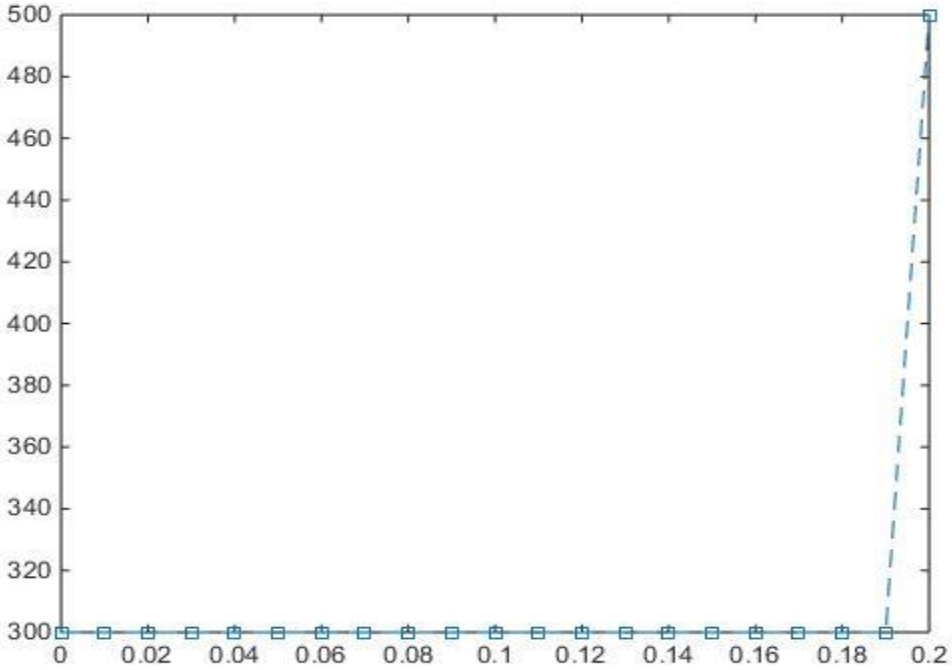
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

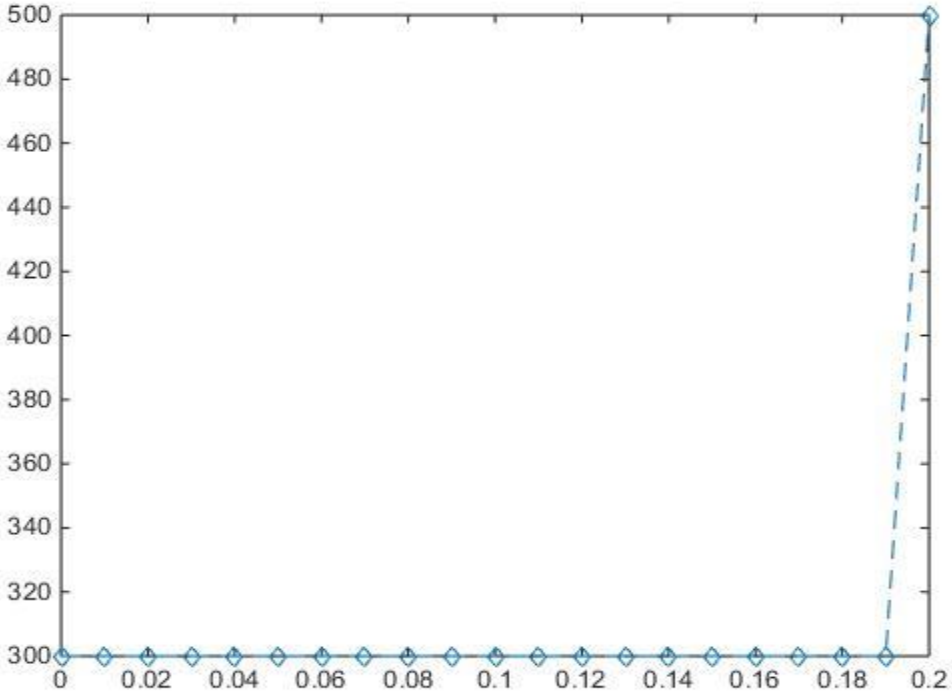
dt = 0.1 and dy = .01

First Boundary Condition



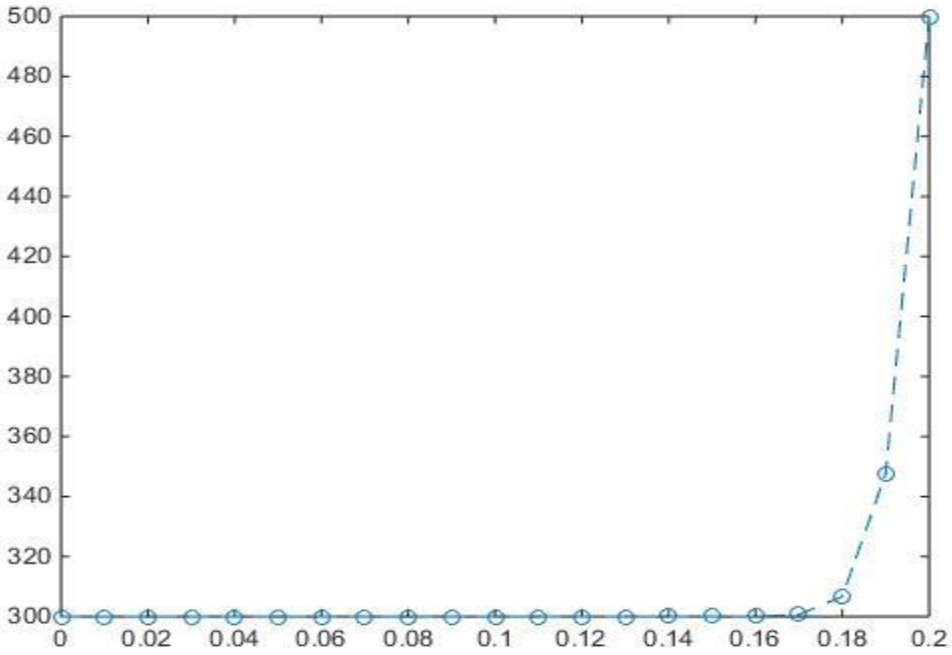


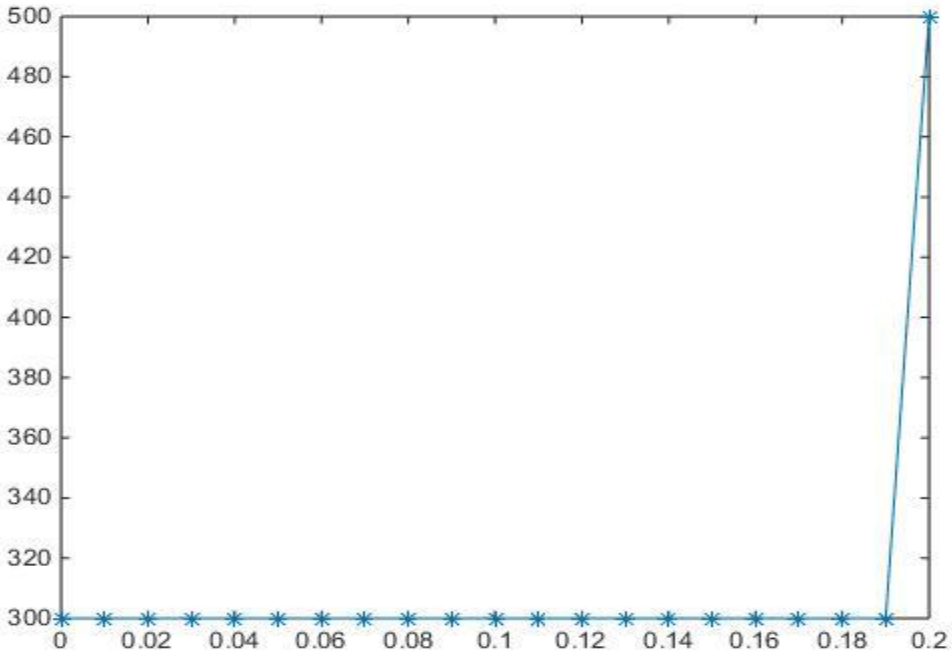


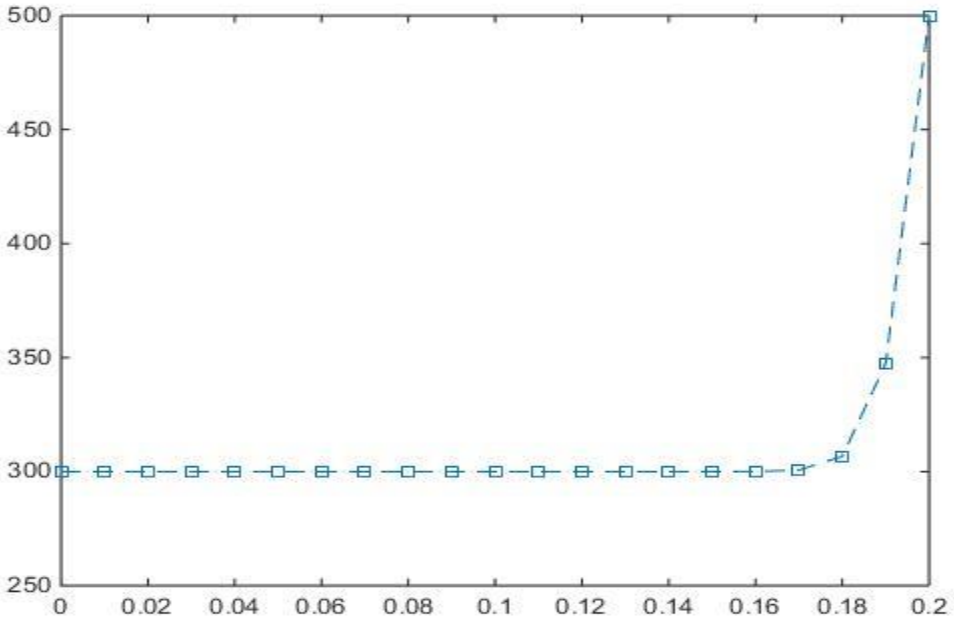


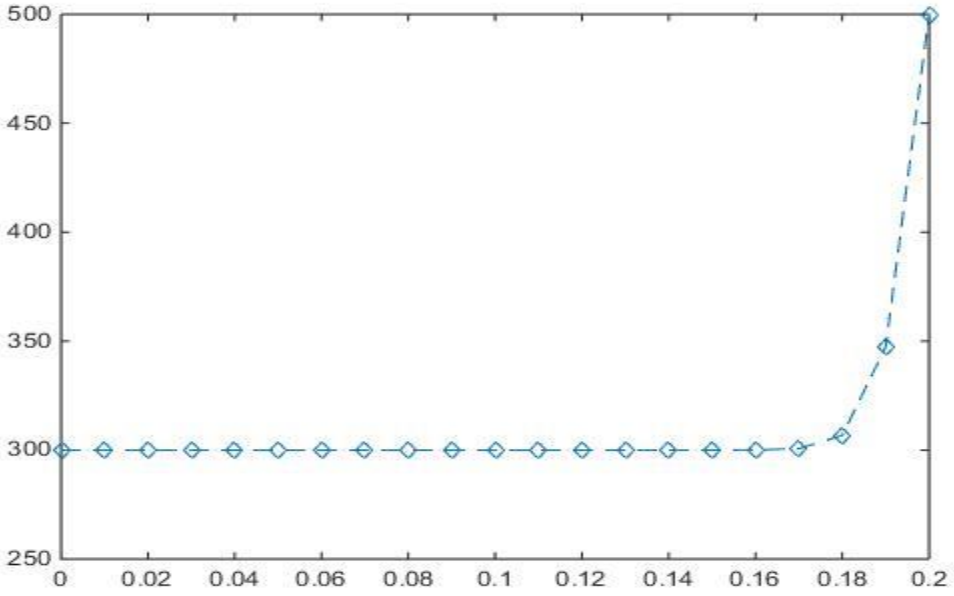
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second Boundary Condition





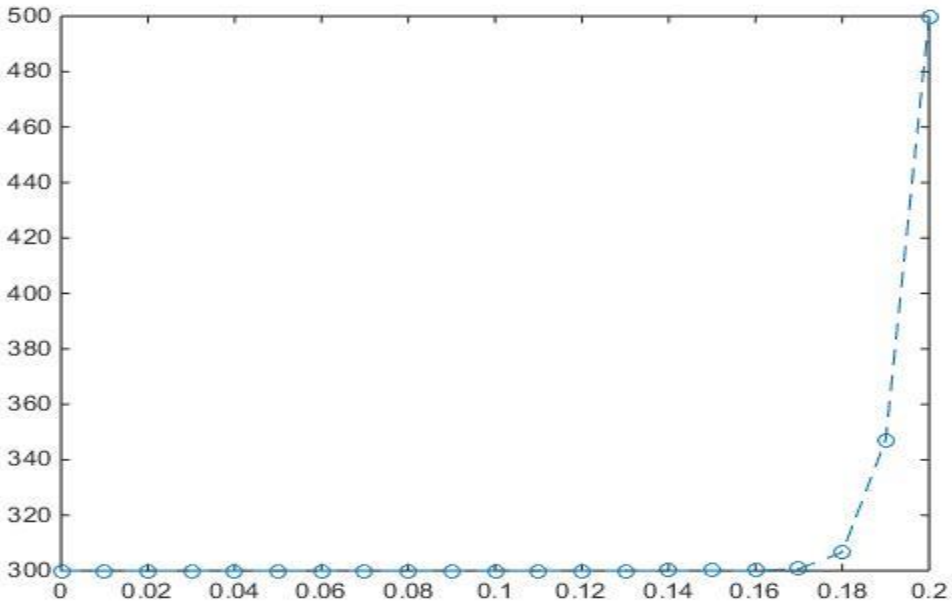


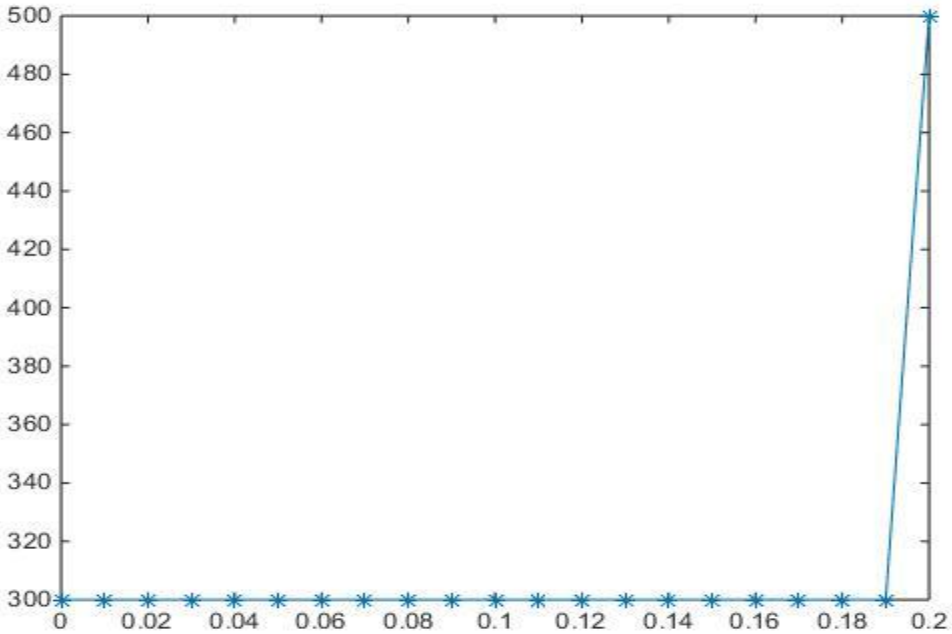


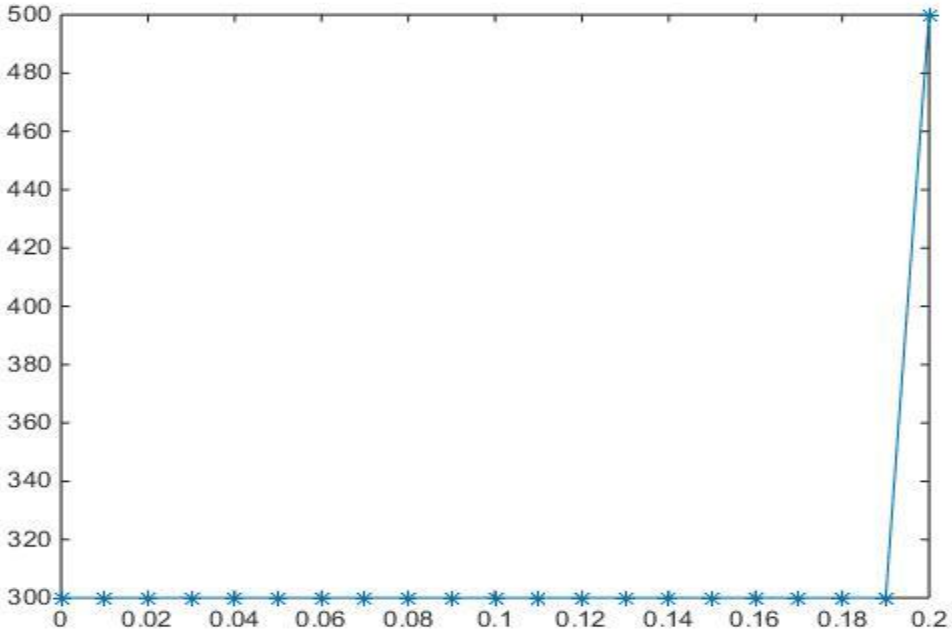
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

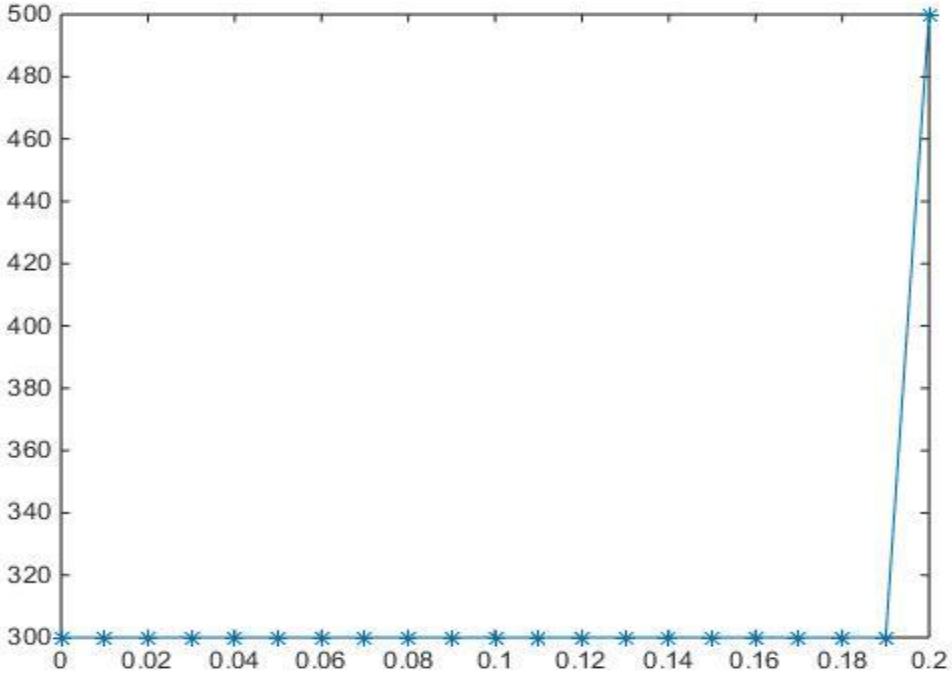
dt = 0.01 and dy = .01

First Boundary Condition



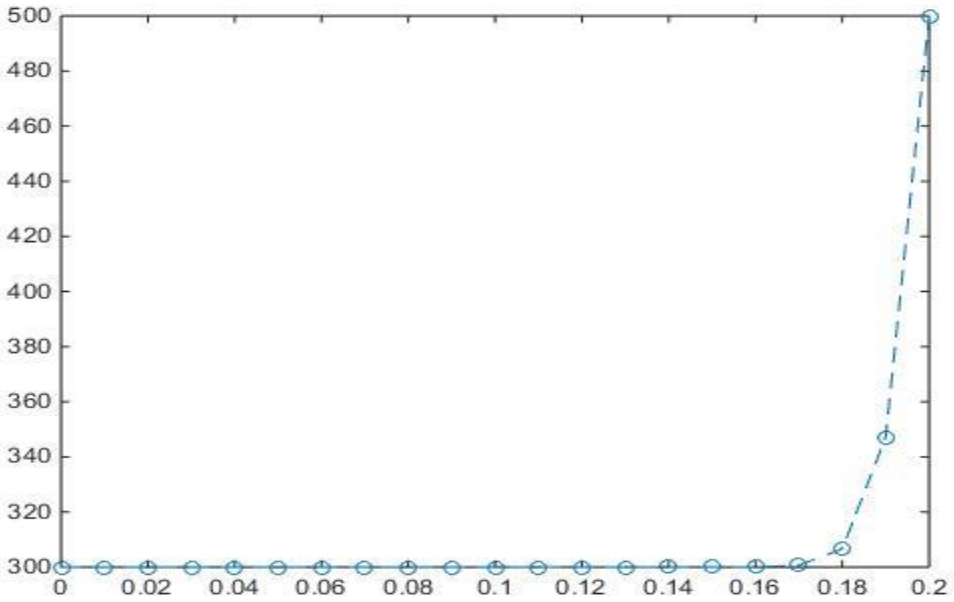


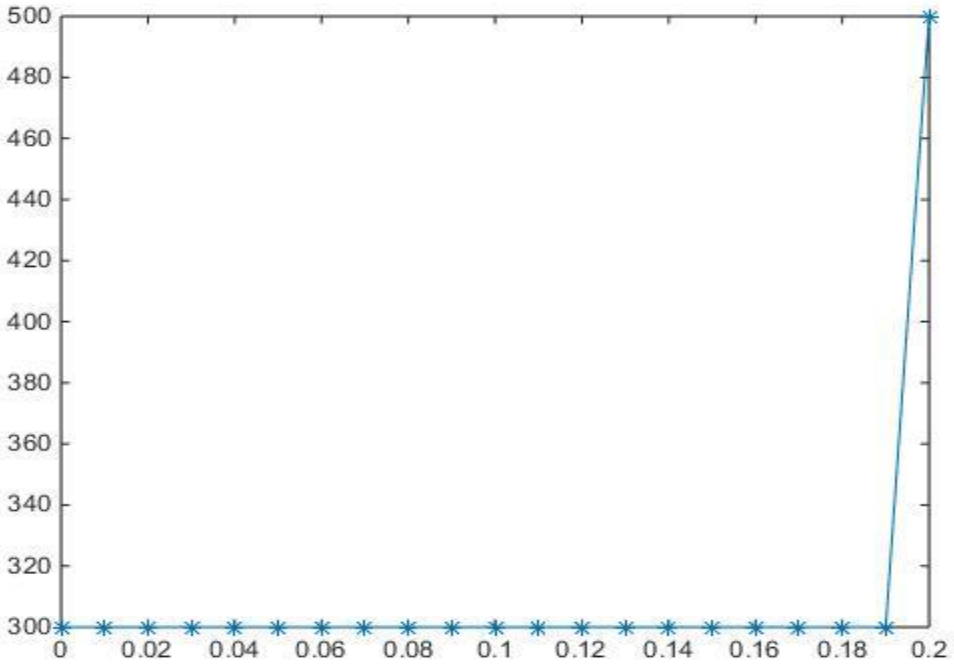


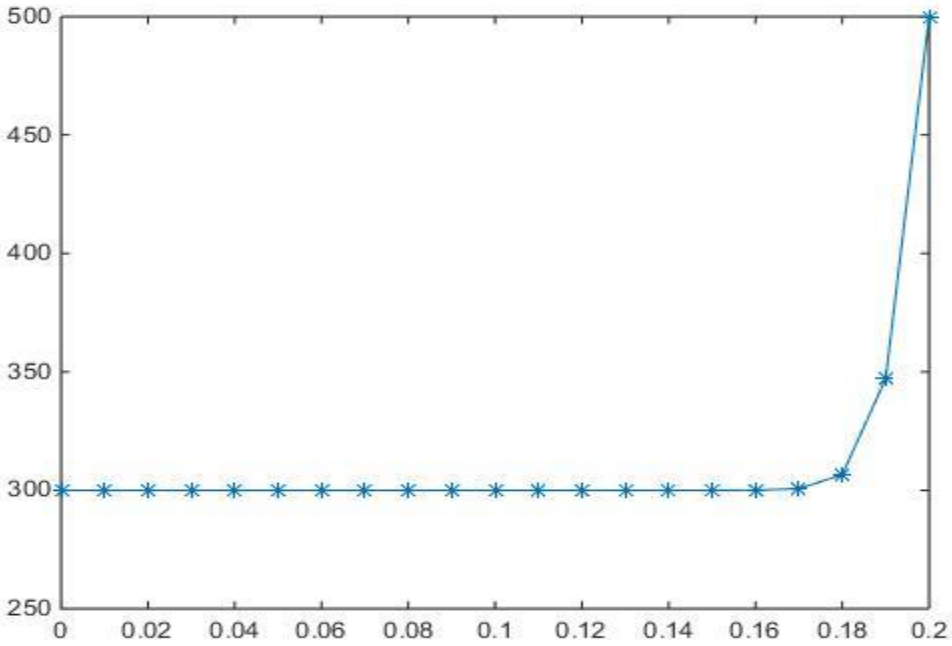


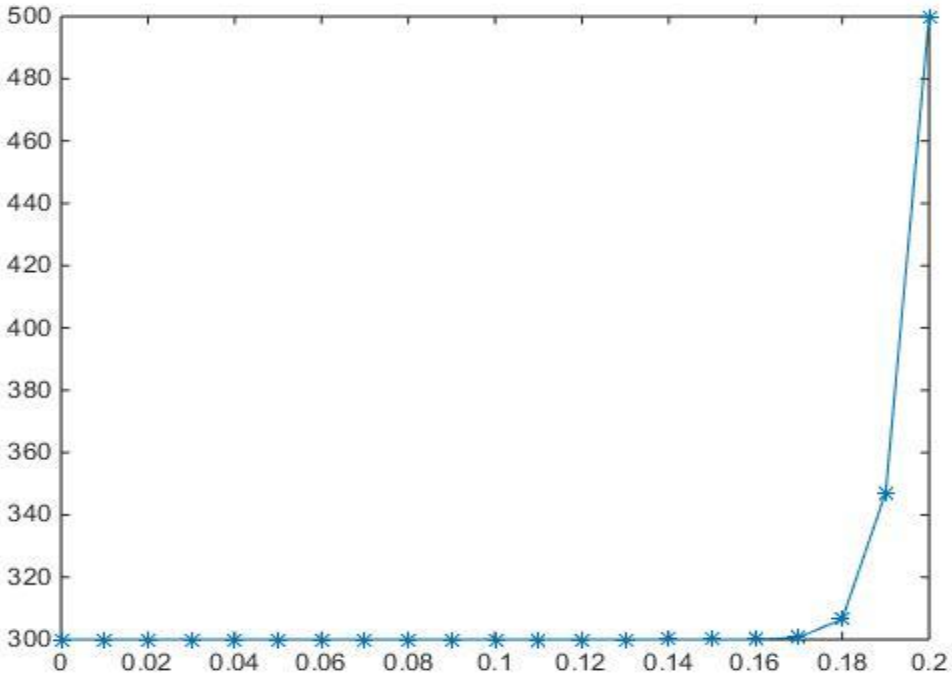
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second Boundary Condition





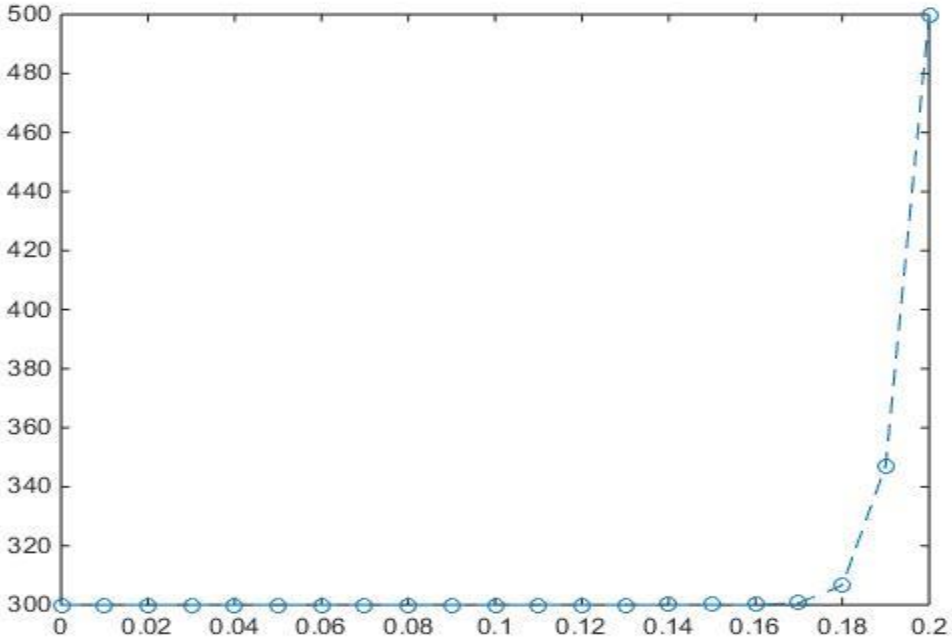


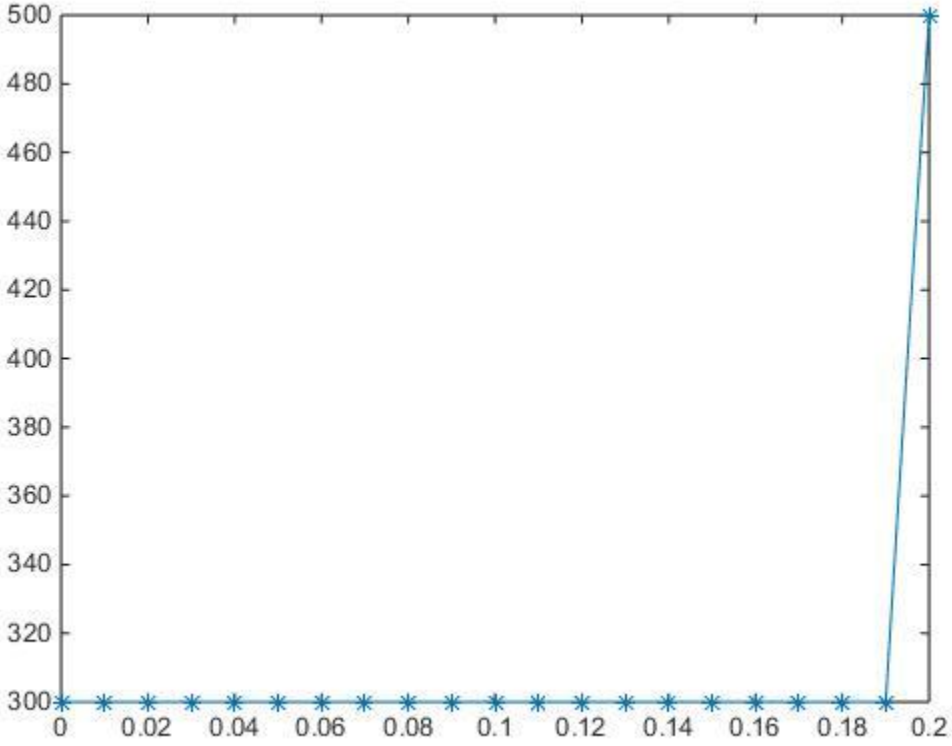


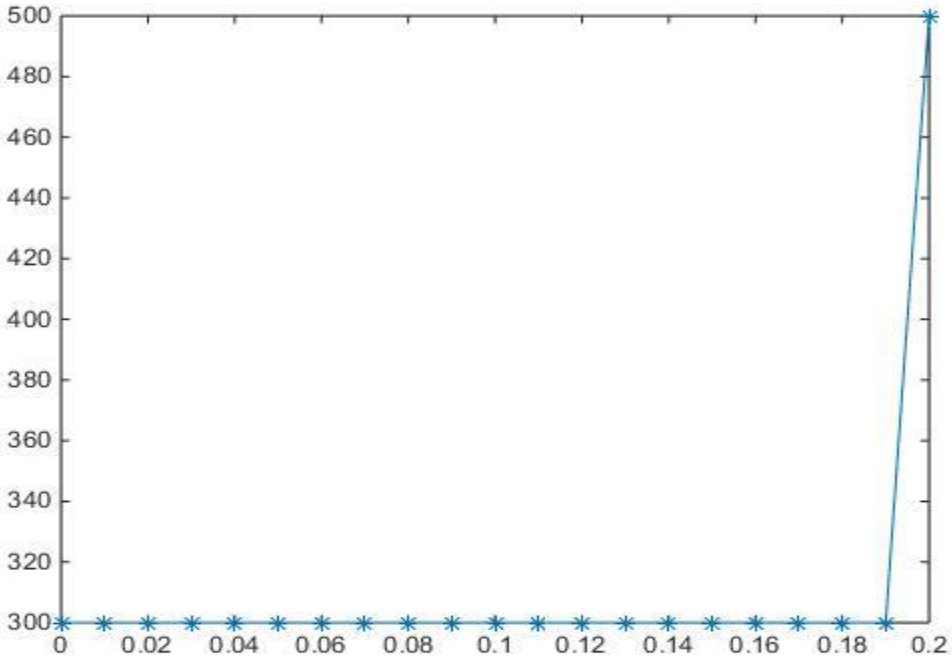
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

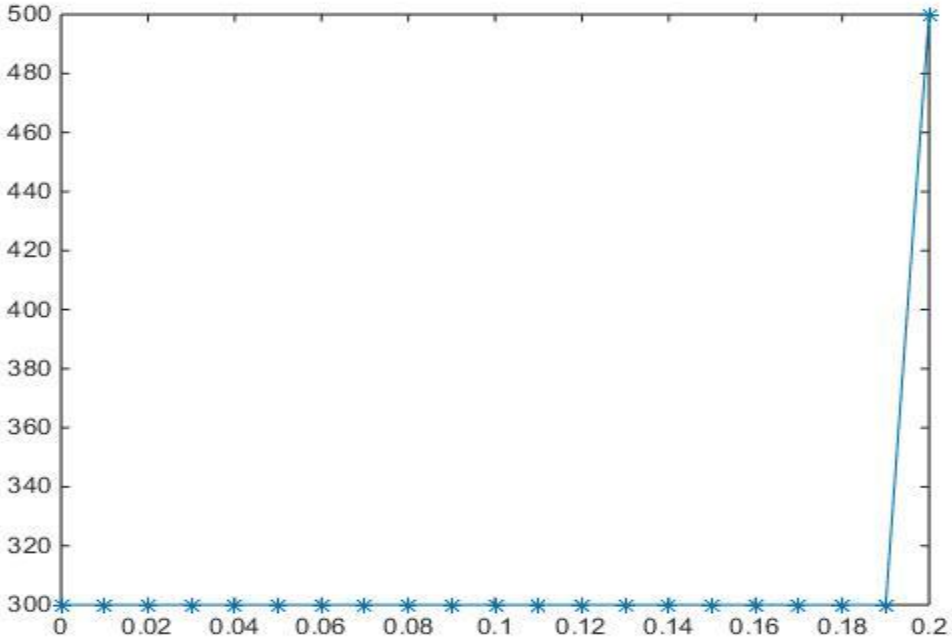
dt = 0.001 and dy = .01

First Boundary Condition



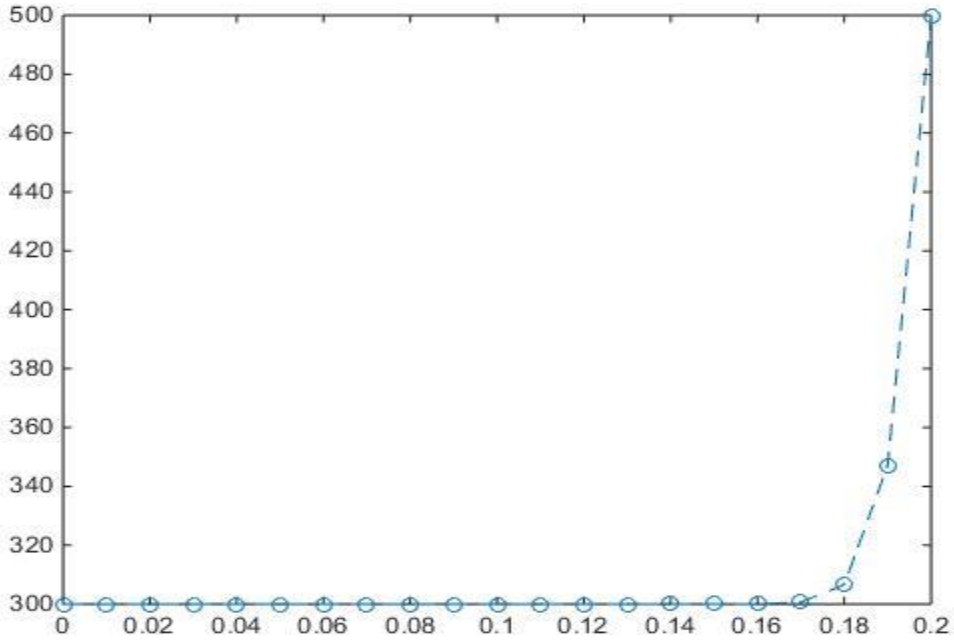


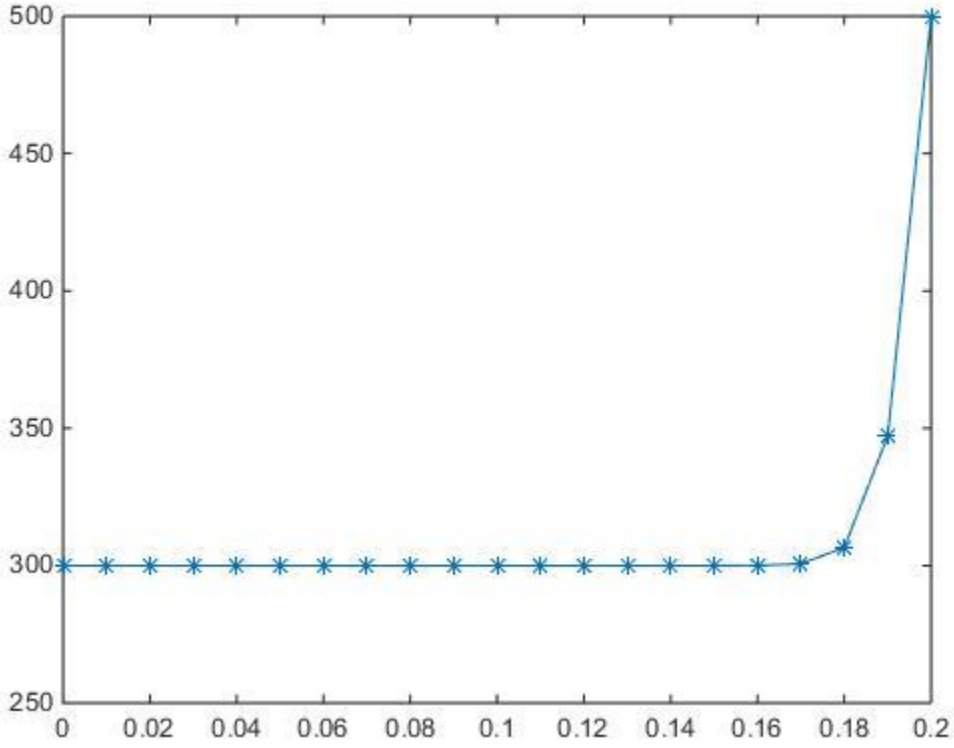


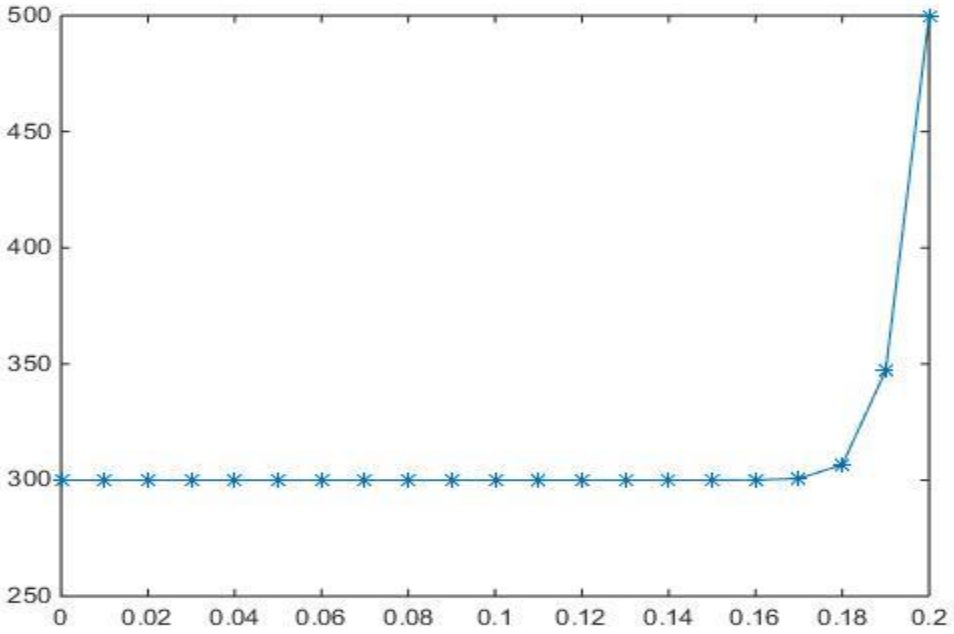


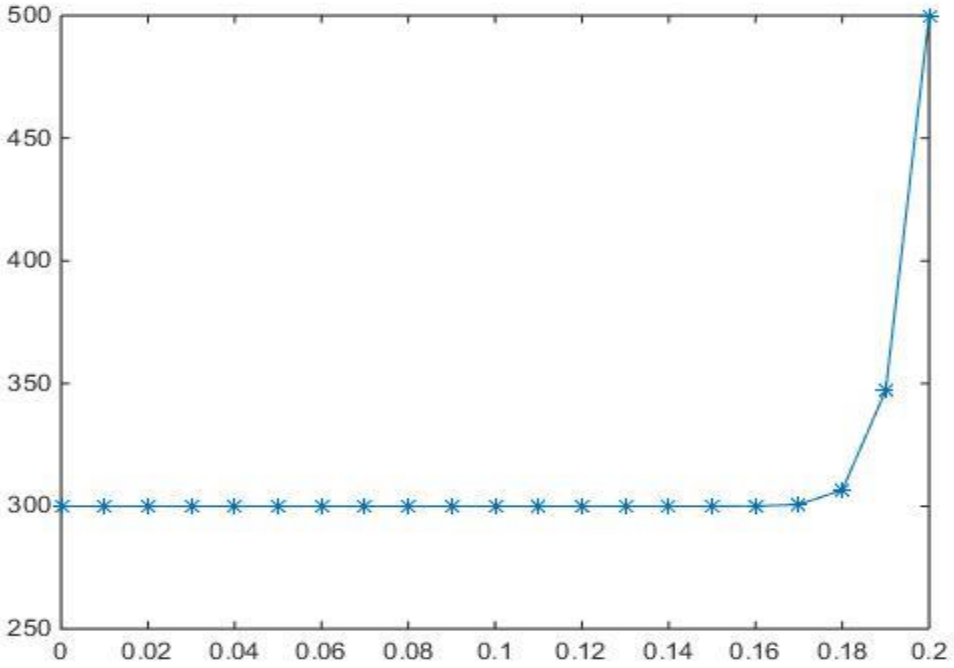
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second Boundary Condition





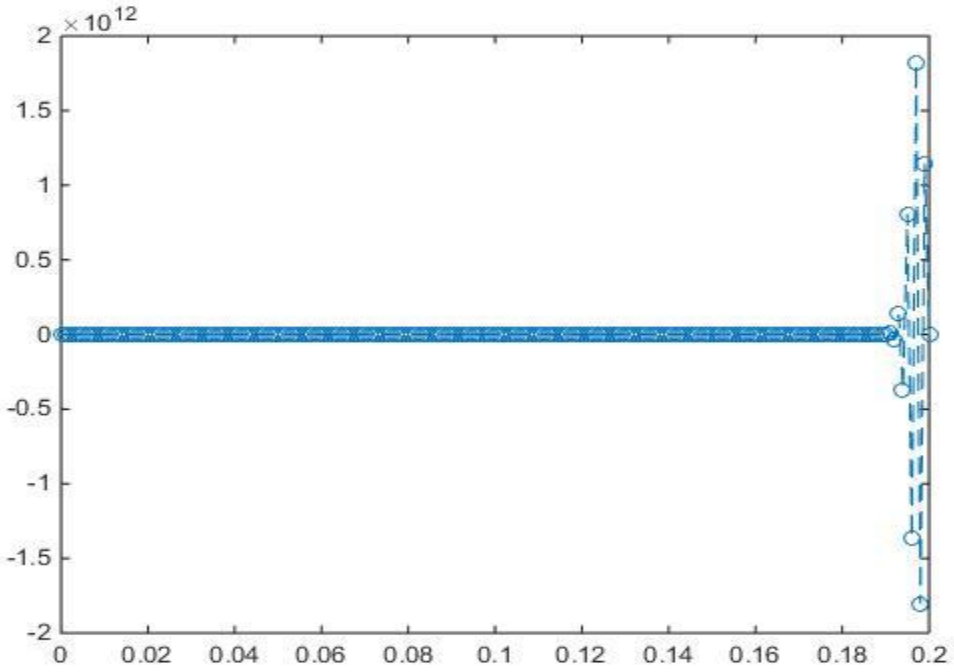


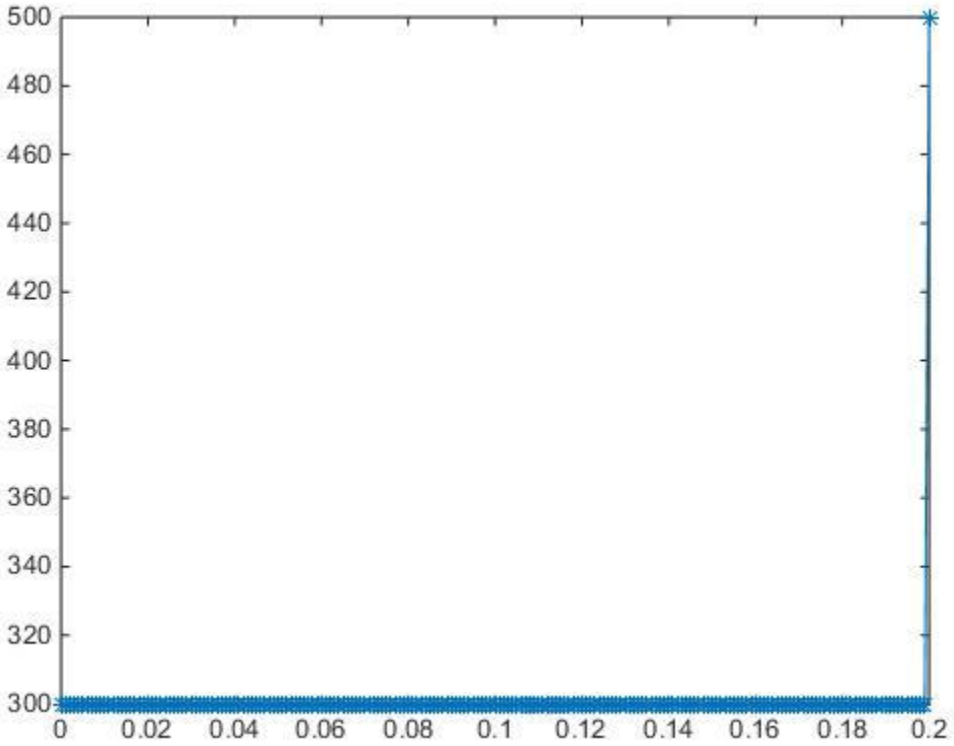


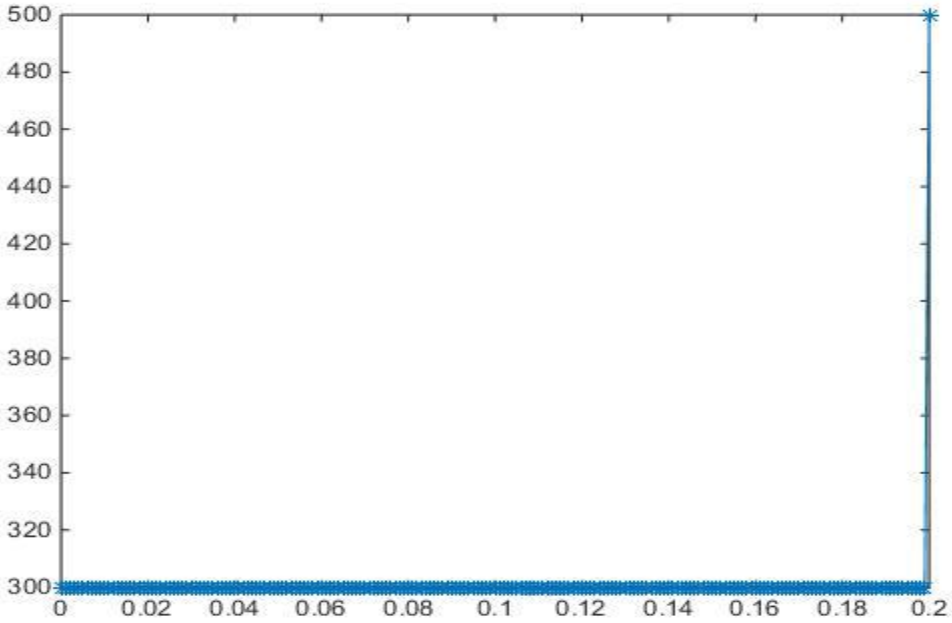
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

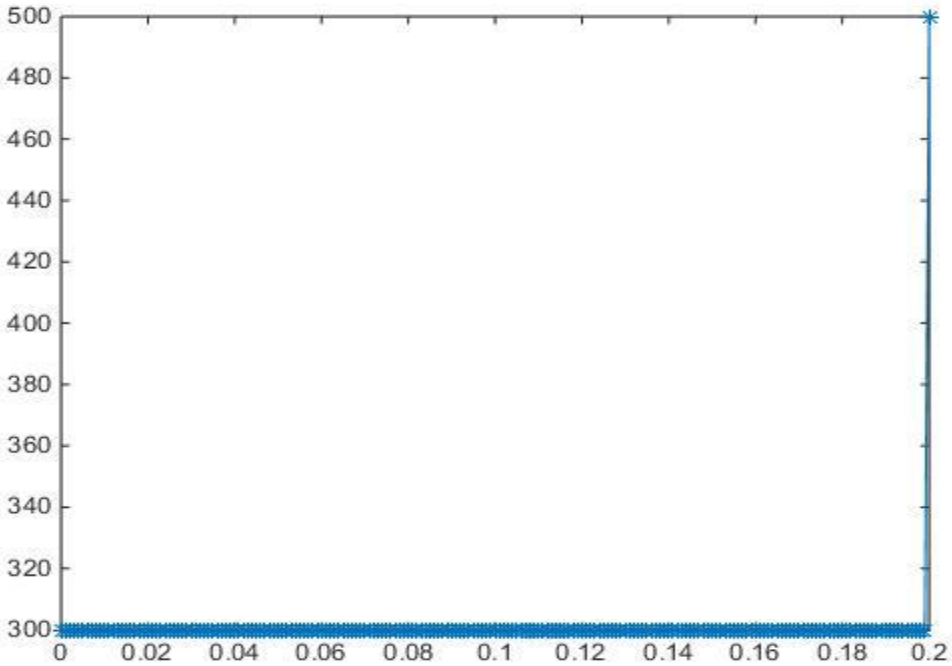
dt = 1 and dy = .001

First Boundary Condition



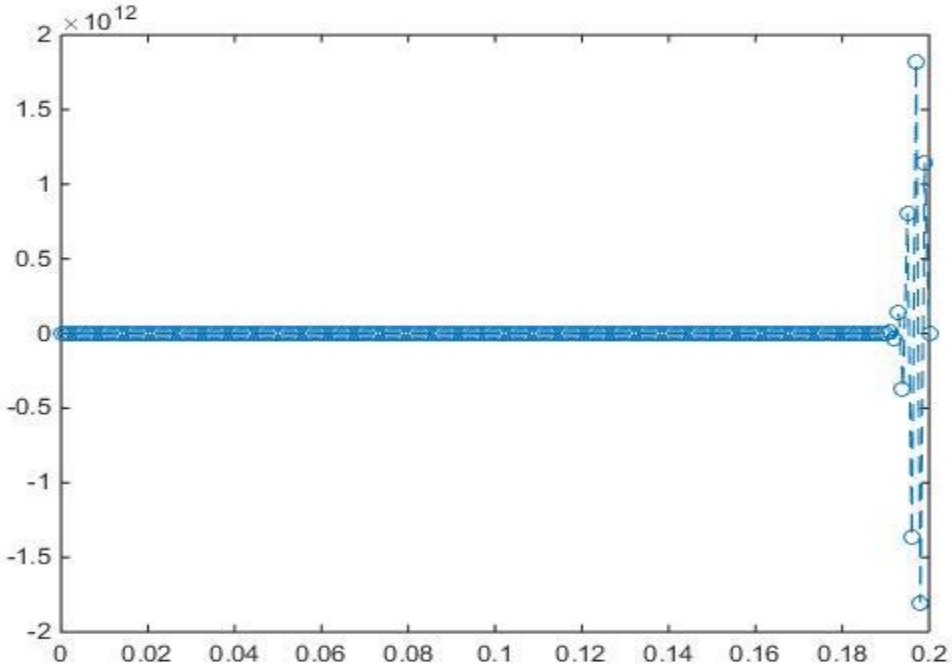


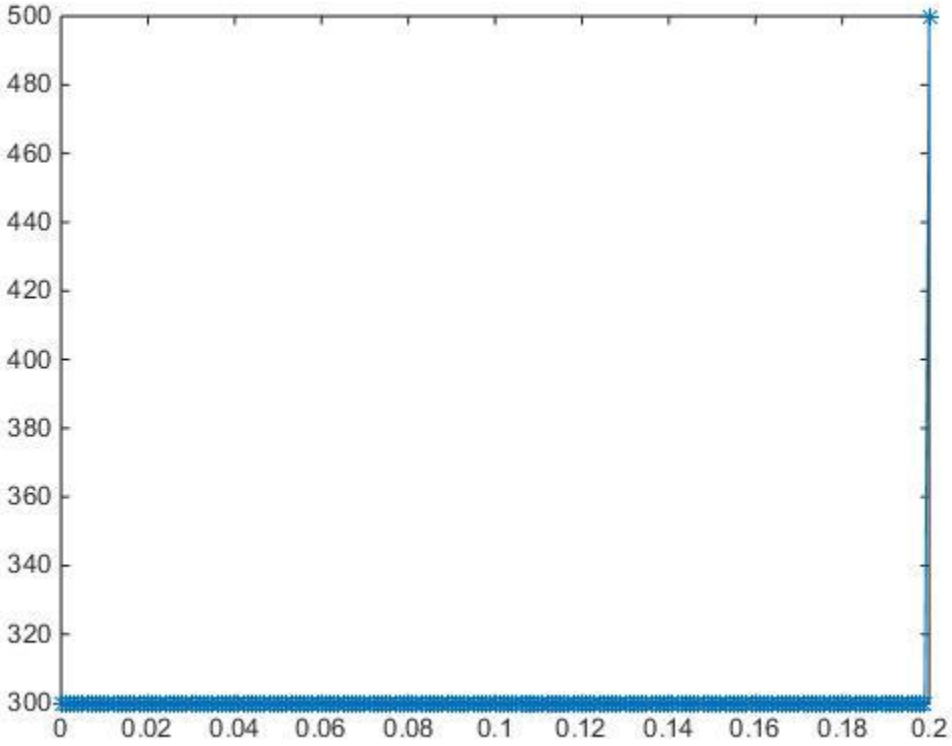


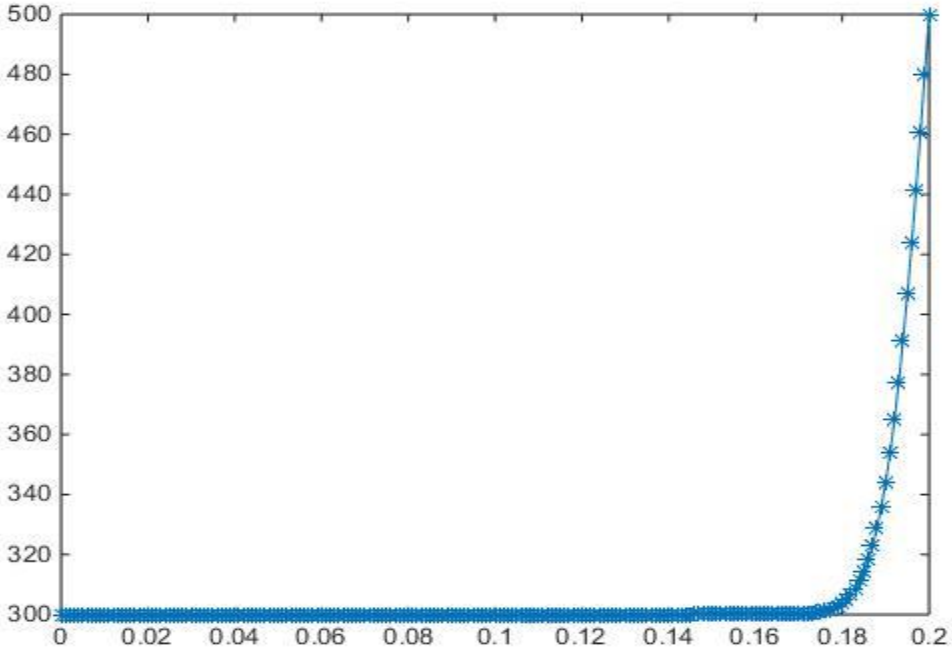


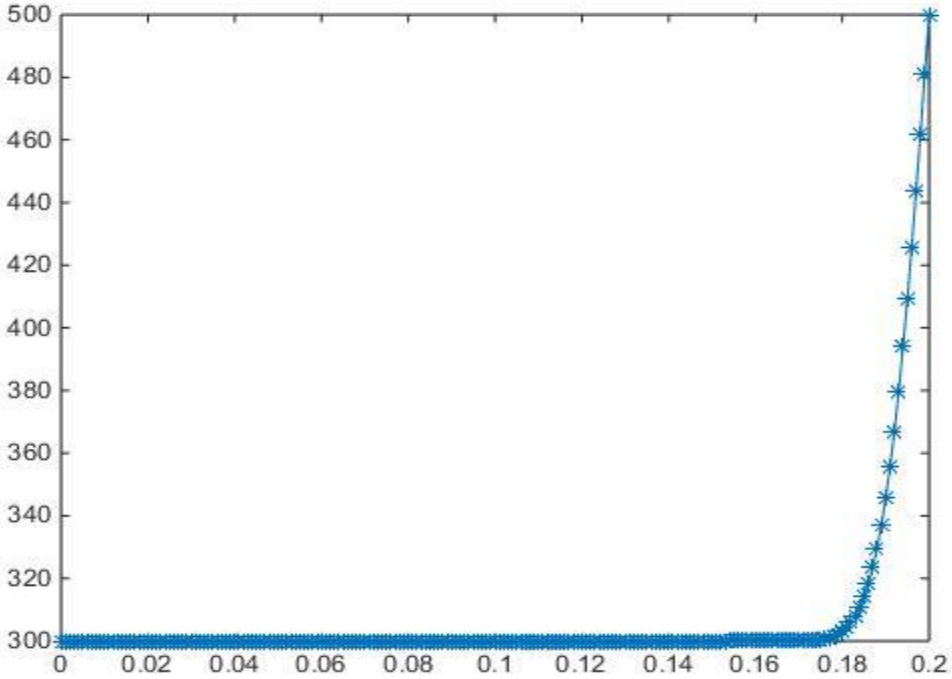
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second Boundary Condition





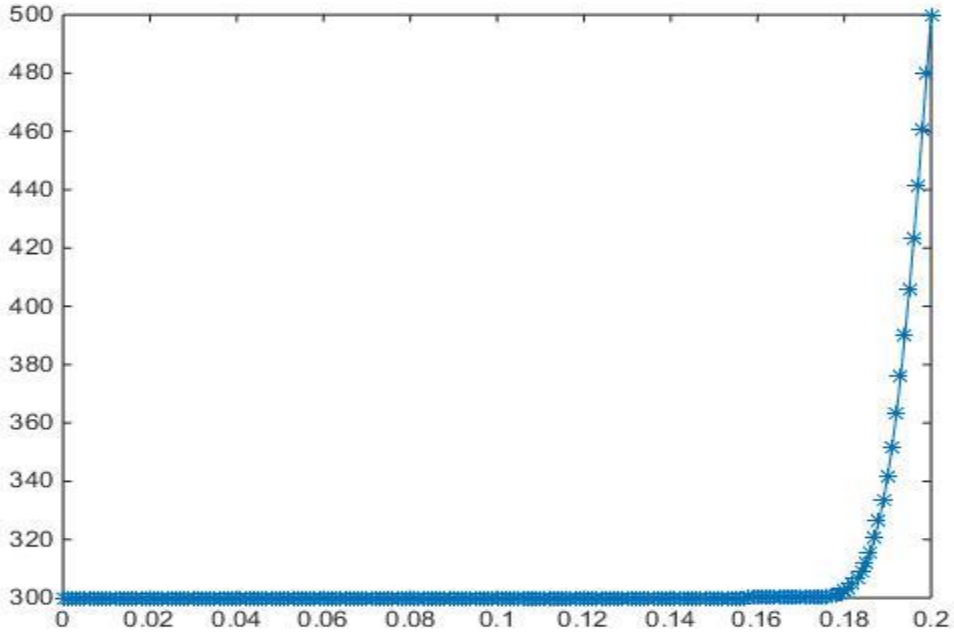


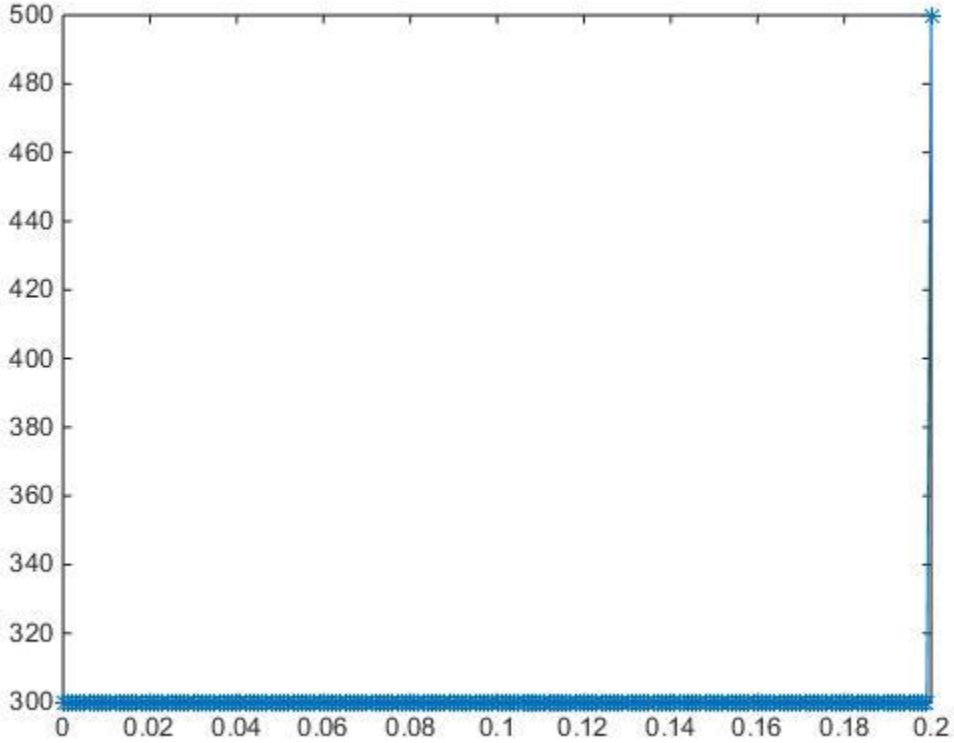


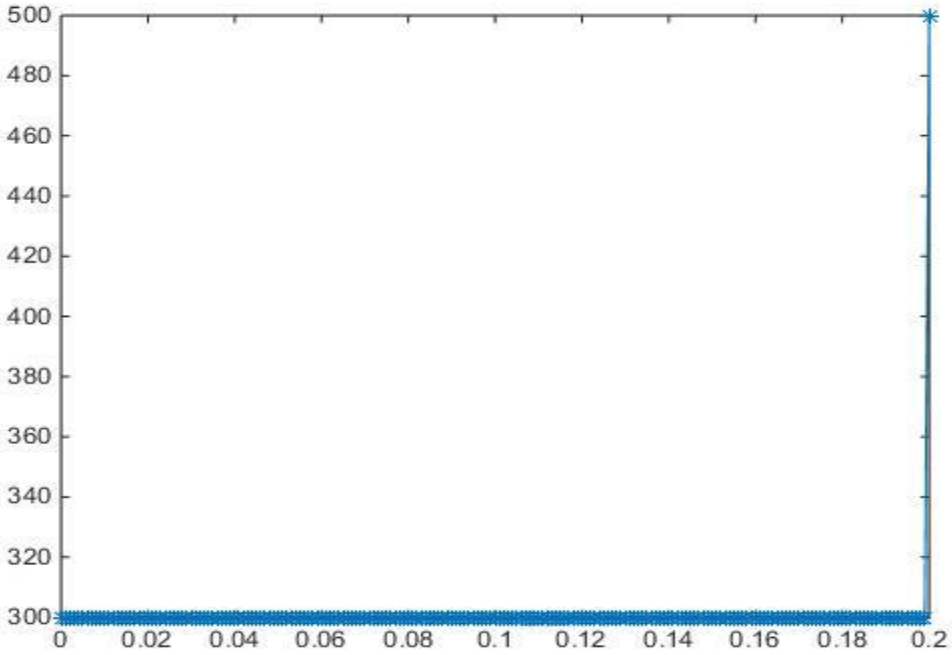
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

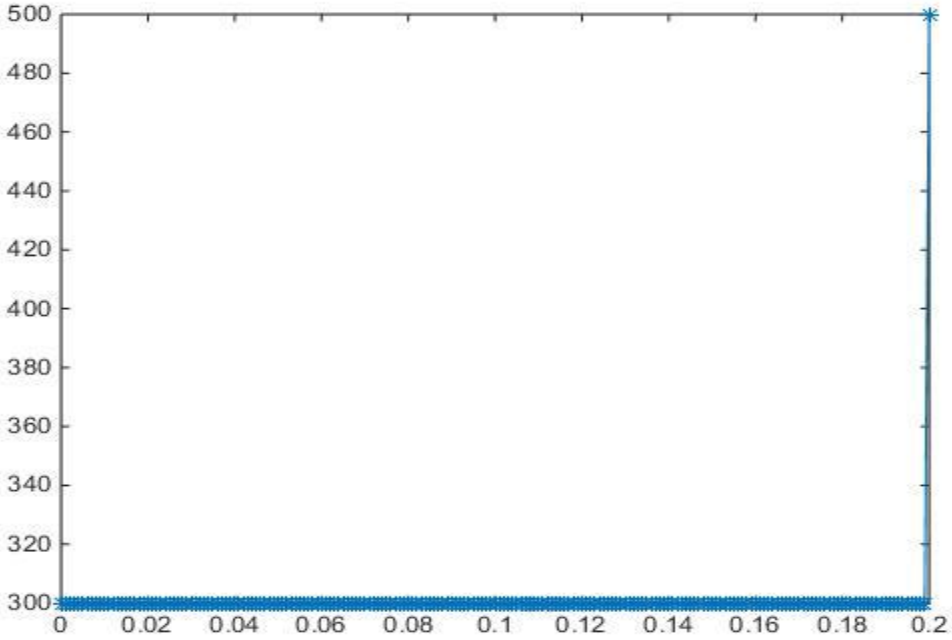
dt = 0.1 and dy = .001

First Boundary Condition



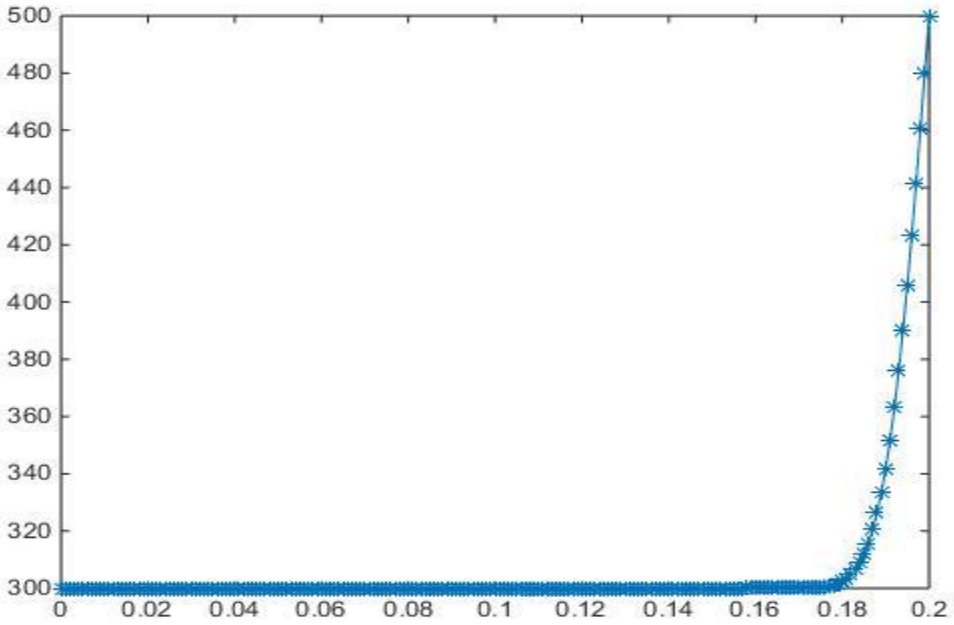






1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second BC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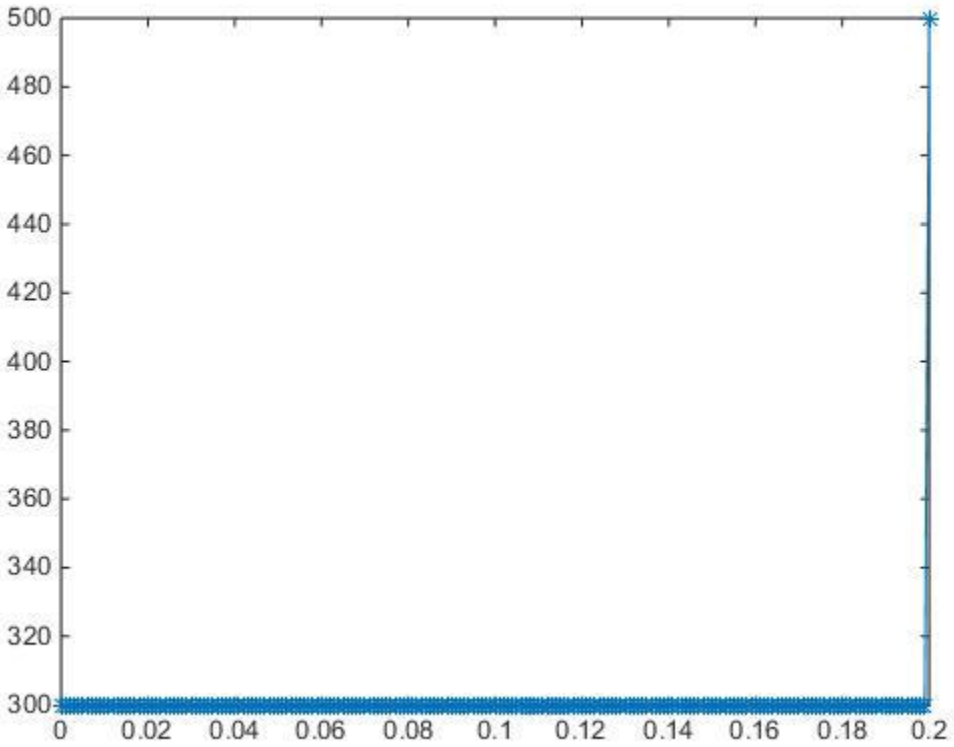
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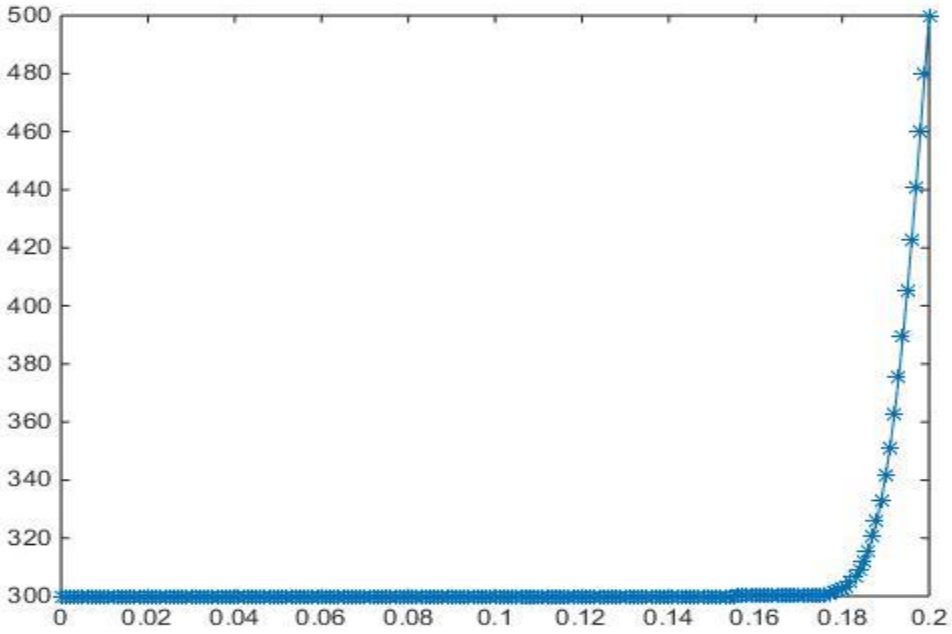
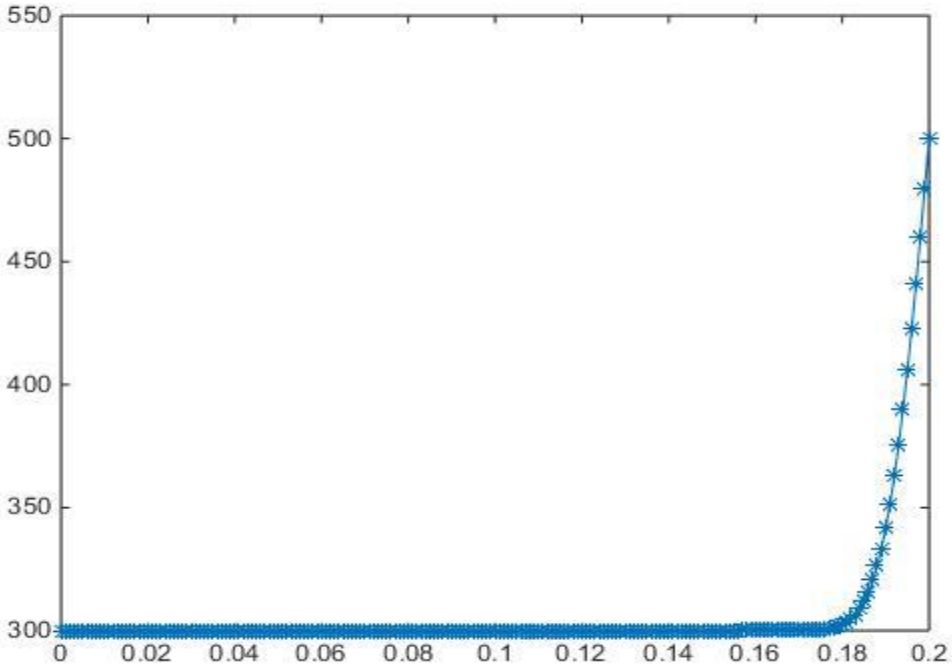
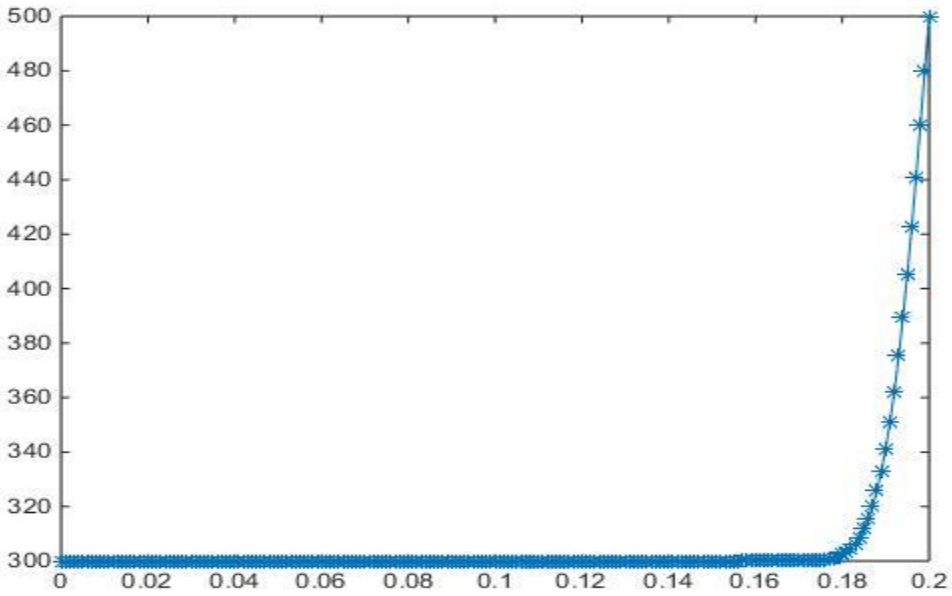


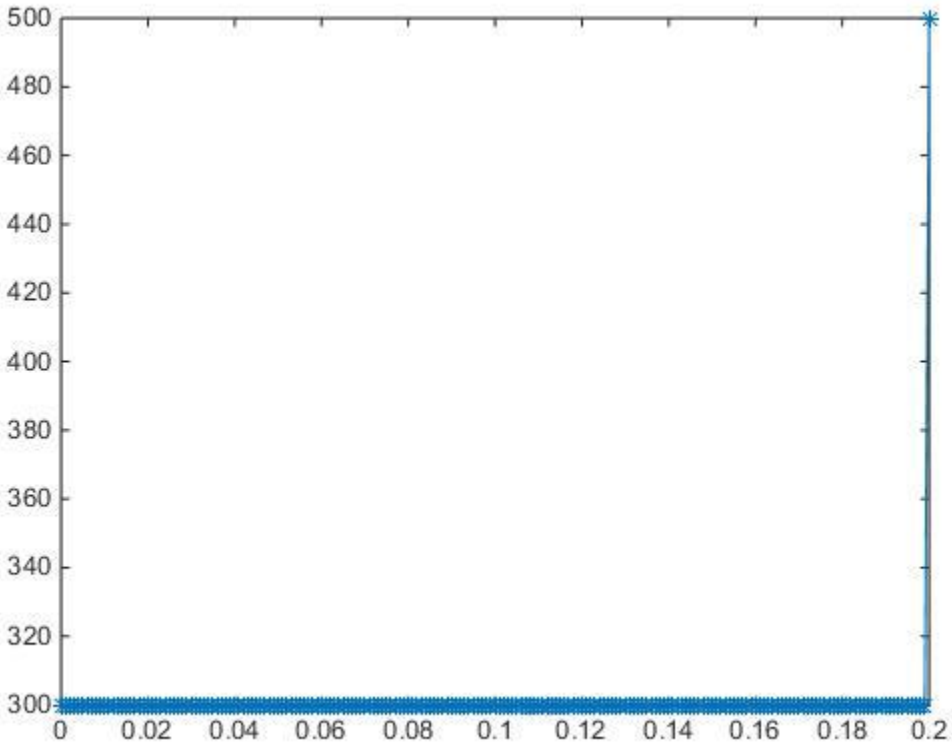


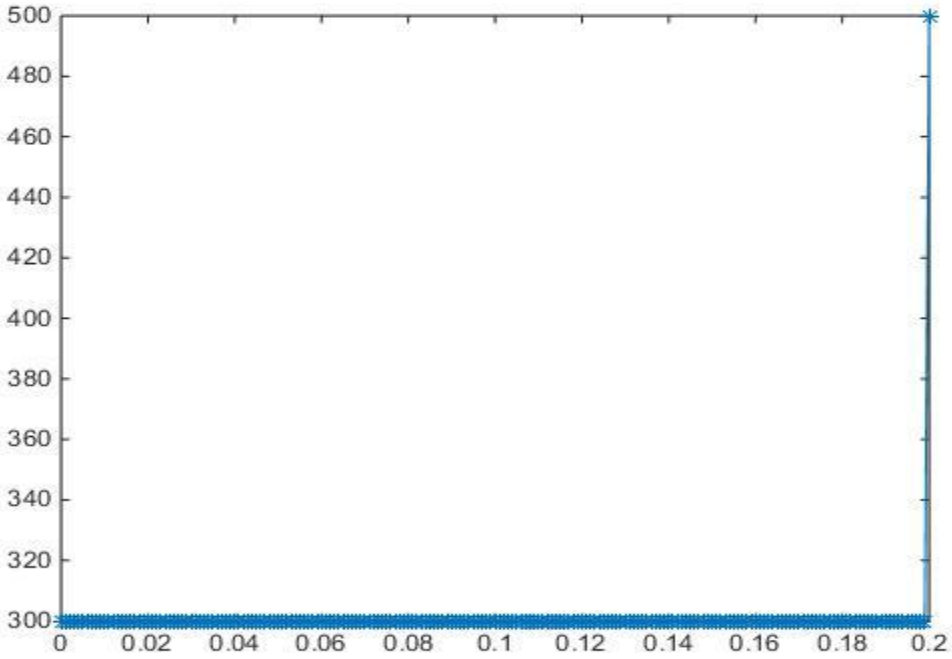
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

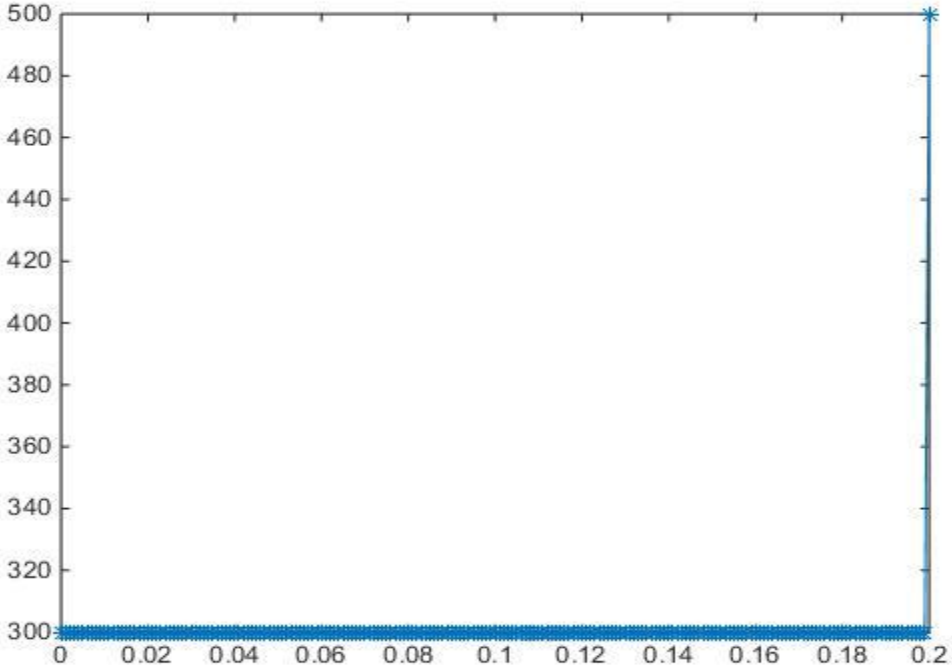
dt = 0.01 and dy = .001

First Boundary Condition



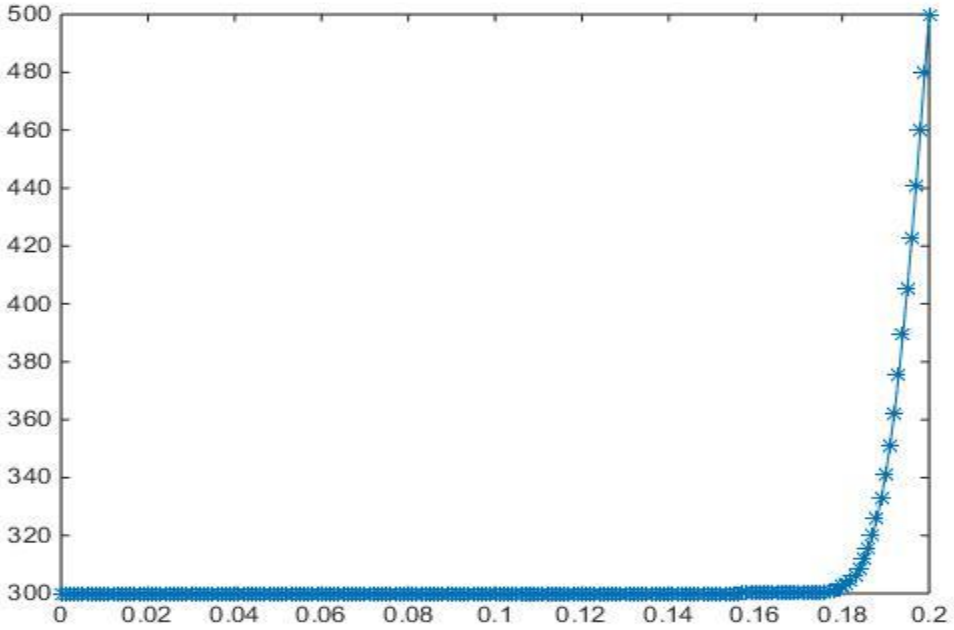






1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second BC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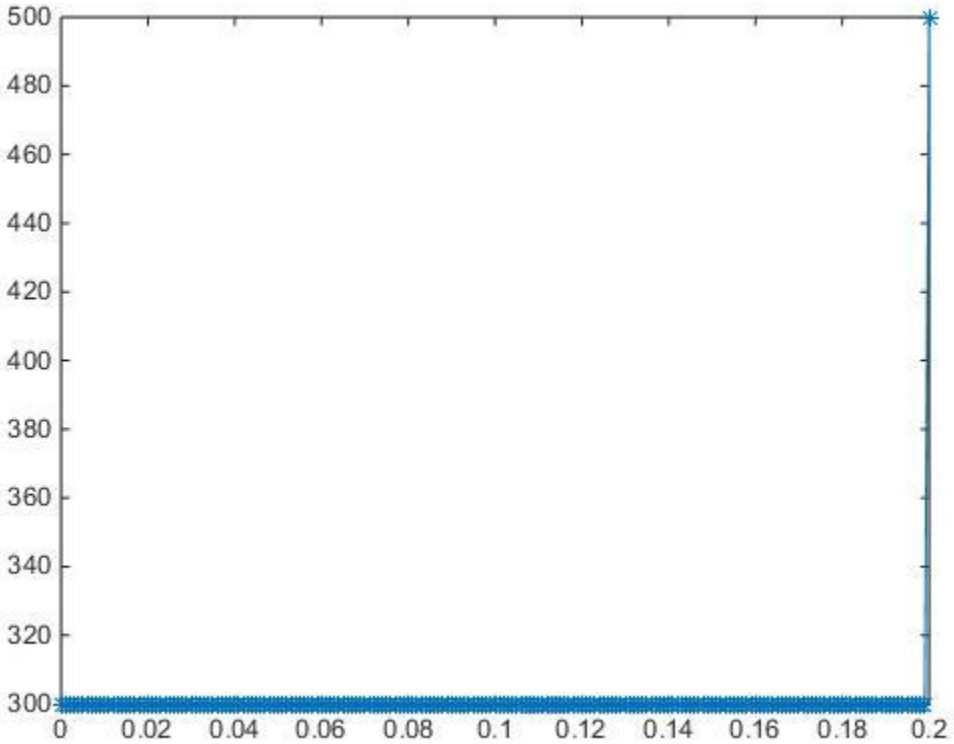
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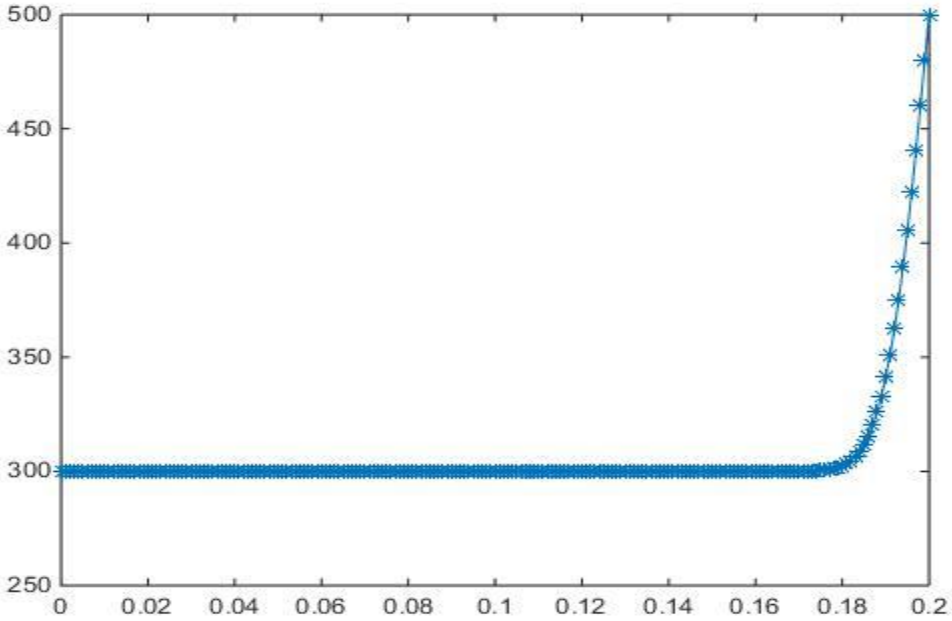
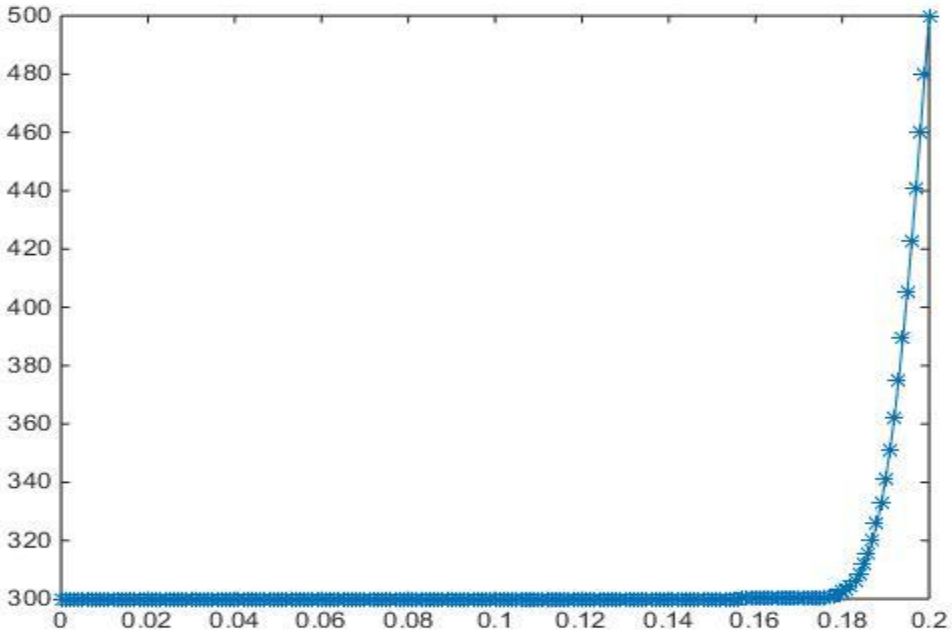
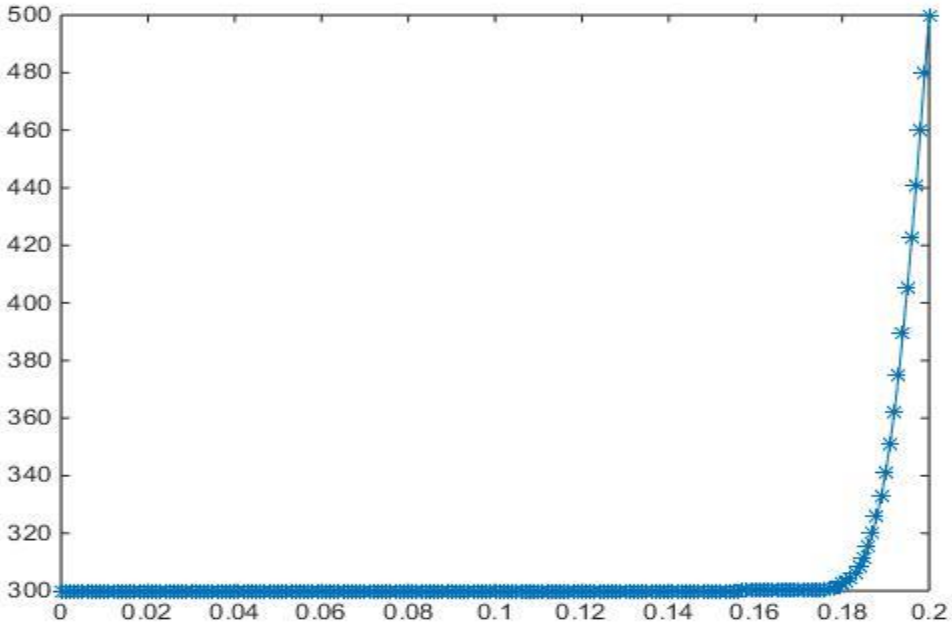


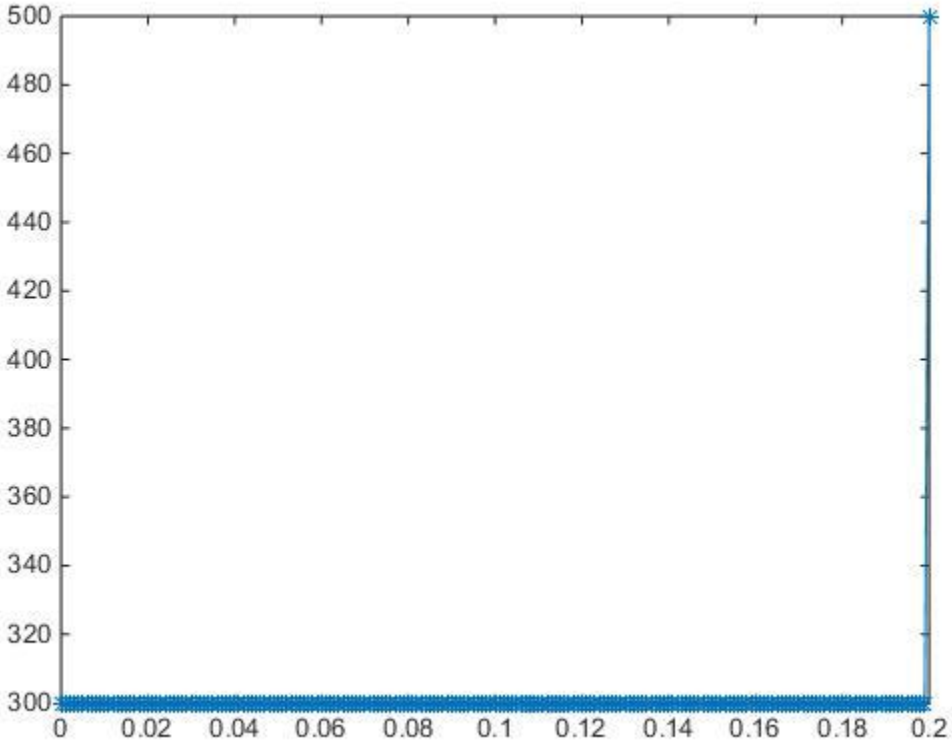


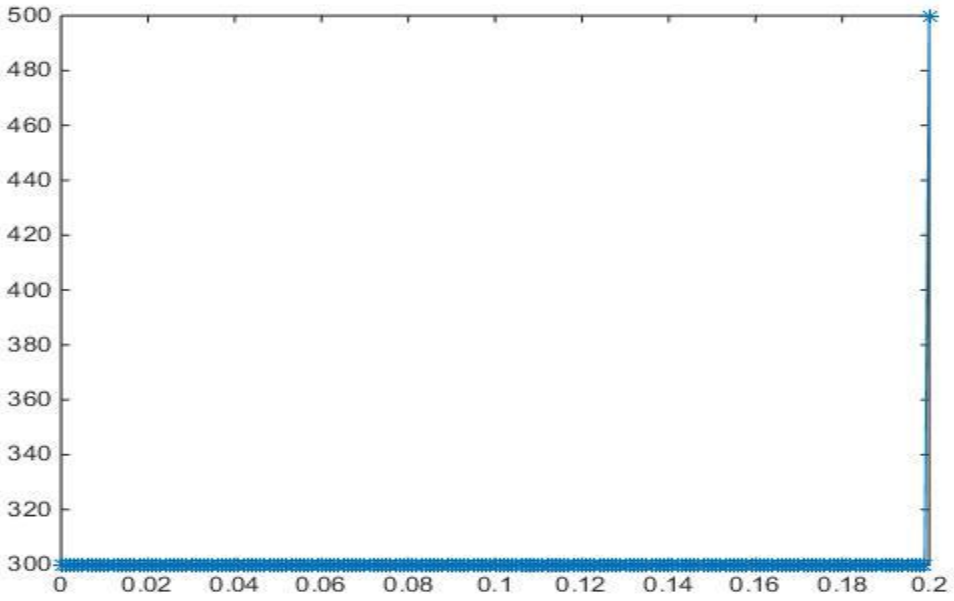
1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

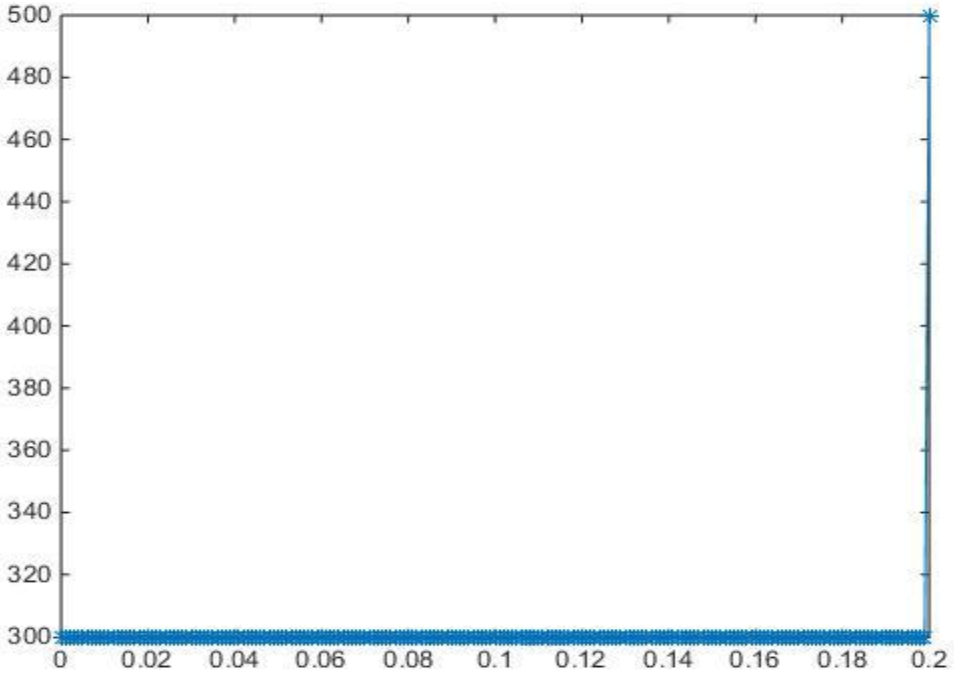
dt = 0.001 and dy = .001

First Boundary Condition



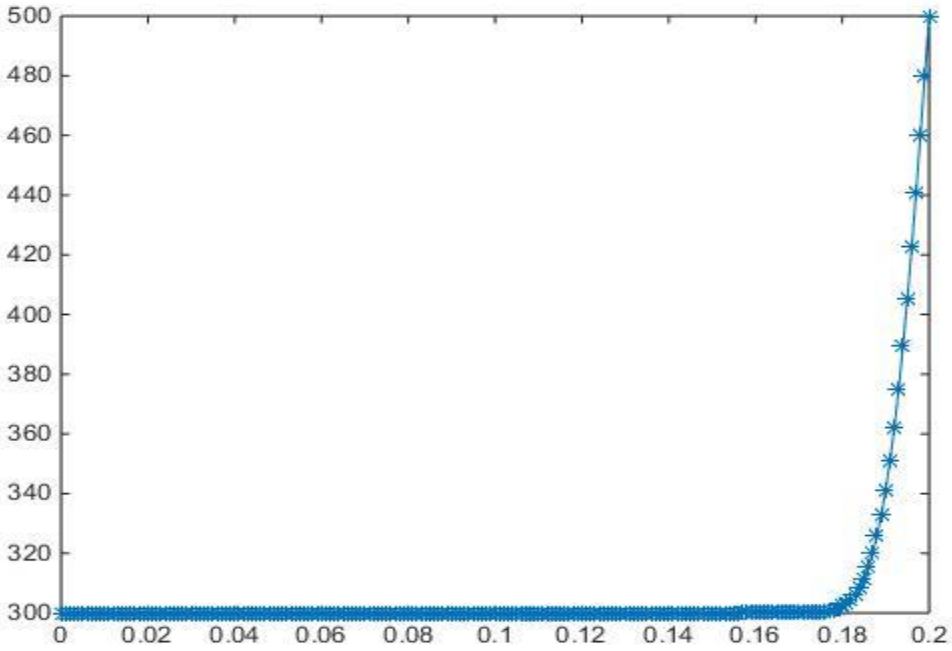






1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Second BC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460
440
420
400
380
360
340
320
300
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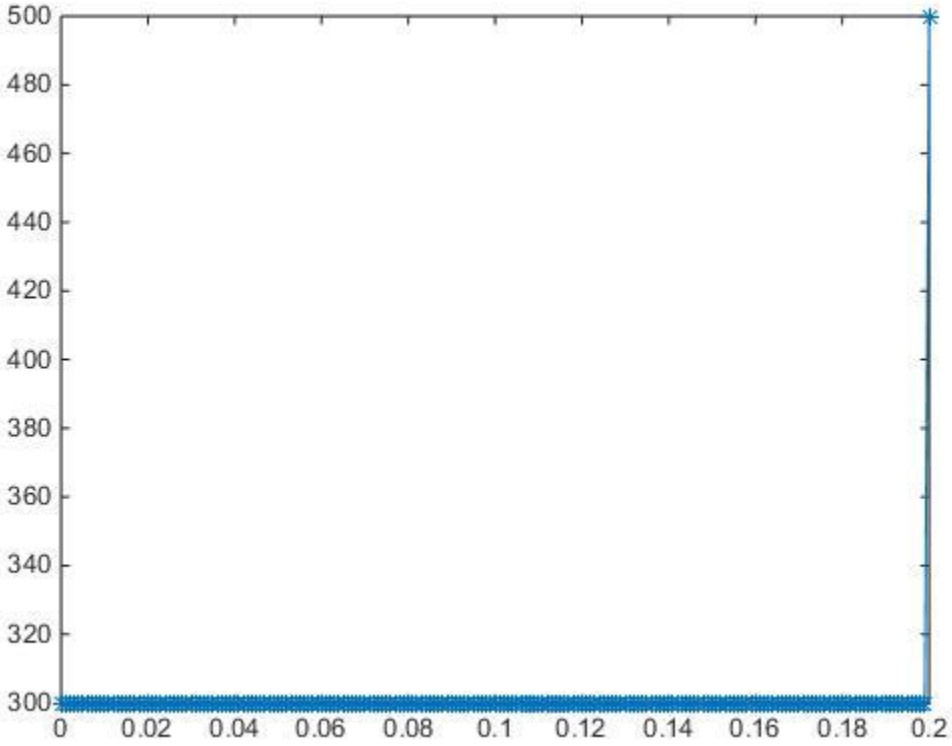
0.02
0.04
0.06
0.08
0.1
0.12
0.14
0.16
0.18
0.2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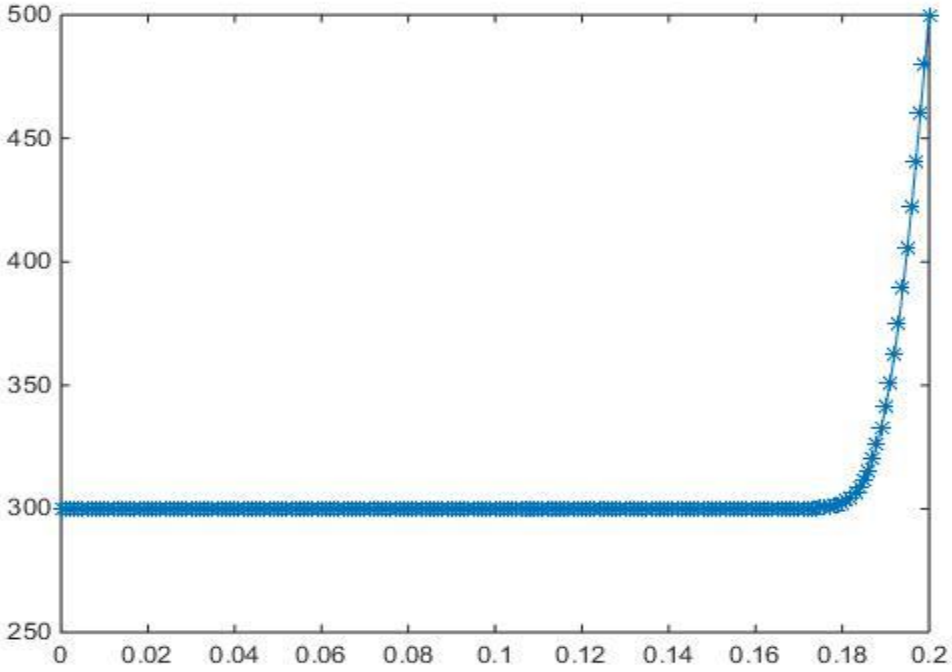

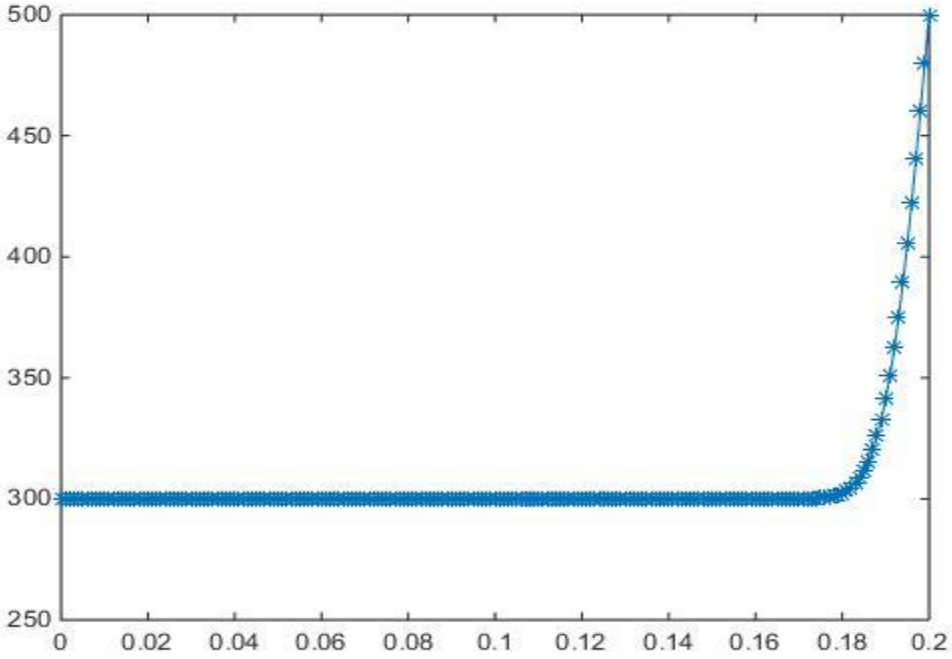

1) FTCS 2)Du Fort Frenkel 3)Implicit Method 4)Crank Nicholson

Conclusions

- All the methods give similar solutions as seen from the graph
- As the value of delta y increases the graph becomes smoother as we are able to capture the gradients in a better manner
- The explicit methods satisfies the stability criterion for all the cases except for the combination delta y = 0.001 and delta t =1
  ($\alpha\partial t/(\partial y)$^2) > 0.5 for this case)
- The implicit method and the Crank Nicholson method always gave stable solutions irrespective of values of delta t and delta y