```matlab
h = 2/100;
k = 2/100;
dt = 1/2500;

x0 = -1;
y0 = -1;
t0 = 0;

xn = 1;
yn = 1;
tn = 1;

x = x0:h:xn;
y = y0:k:yn;
t = t0:dt:tn;

n = length(x);
m = length(y);
p = length(t);

u = zeros(n, m, p);

for i=1:n-1
    for j=1:m-1
        u(i, j, 1) = cos(pi*x(i)/2)*cos(pi*y(j)/2);
    end
end

for step = 1:p-1
    u1 = zeros(n,m);
    for j = 2:m-1
        a = zeros(n,1);
        b = zeros(n,1);
        c = zeros(n,1);
        d = zeros(n,1);
        % Finding the entries of the tridiagonal matrix
        for i = 2:n-1
            a(i) = 1/(2*h*h);
            b(i) = -1/dt-1/(h*h);
            c(i) = 1/(2*h*h);
            d(i) = -0.5*(u(i,j+1,step)-2*u(i,j,step)+u(i,j-1,step))/(k*k)-
u(i,j,step)/dt;
        end
        % Thomas algorithm
        gamma = zeros(n,1);
        beta = zeros(n,1);
        gamma(2) = c(2)/b(2);
        beta(2) = d(2)/b(2);
        a(2) = 0;
        c(n-1) = 0;
        for i=3:n-1
            gamma(i) = (c(i))/(b(i)-a(i)*gamma(i-1));
```

```matlab
                beta(i) = (d(i)- a(i)*beta(i-1))/(b(i)-a(i)*gamma(i-1));
            end
            u1(n-1,j)=beta(n-1);
            for i=n-2:-1:2
                u1(i,j) = beta(i) - gamma(i)*u1(i+1,j);
            end
        end
    end
    for i = 2:n-1
        a = zeros(m,1);
        b = zeros(m,1);
        c = zeros(m,1);
        d = zeros(m,1);
        % Finding the entries of the tridiagonal matrix
        for j = 2:m-1
            a(j) = 1/(2*k*k);
            b(j) = -1/dt-1/(k*k);
            c(j) = 1/(2*k*k);
            d(j) = -0.5*(u1(i+1,j)-2*u1(i,j)+u1(i-1,j))/(h*h)-u1(i,j)/dt;
        end
        % Thomas algorithm
        gamma = zeros(m,1);
        beta = zeros(m,1);
        gamma(2) = c(2)/b(2);
        beta(2) = d(2)/b(2);
        a(2) = 0;
        c(m-1) = 0;
        for j=3:m-1
            gamma(j) = (c(j))/(b(j)-a(j)*gamma(j-1));
            beta(j) = (d(j)- a(j)*beta(j-1))/(b(j)-a(j)*gamma(j-1));
        end
        u(i,m-1,step+1)=beta(m-1);
        for j=m-2:-1:2
            u(i,j,step+1) = beta(j) - gamma(j)*u(i,j+1,step+1);
        end
    end
end

p1u = zeros(n,1);
for i = 1:n
    p1u(i)=u(i,i,301);
end
p2u = zeros(n,1);
for i = 1:n
    p2u(i)=u(i,i,701);
end
p3u = zeros(n,1);
for i = 1:n
    p3u(i)=u(i,i,1201);
end
p4u = zeros(n,1);
for i = 1:n
    p4u(i)=u(i,i,1601);
end
tu = zeros(n,p);
```

```matlab
for i = 1:n
    for ts = 1:p
        tu(i,ts) = u(i,i,ts);
    end
end
figure(1); % Plotting U(x,x) vs x for different time stamps
plot(x,p1u,'r',x,p2u,'b',x,p3u,'g',x,p4u,'m');
grid on;
xlabel('X');
ylabel('U(x,x)');
legend('t=3/25','t=7/25','t=12/25','t=16/25');
figure(2);
surf(x,y,u(:,:,1601));
xlabel('X');
ylabel('Y');
zlabel('U(x,y)');
title('U(x,y) at t=16/25');
figure(3);
mesh(x,t',tu(:,:)');
xlabel('X');
ylabel('t');
zlabel('U(x,x,t)');


display(x, 'X');
display(y, 'Y');
mesh(x,y,u(:,:,26))
% xlabel('Time')
% ylabel('X')
zlabel('U(x) (Solution)')

% plot(x, y, u(x,y,n));

% plot(X, Y, X, Y, '*', X, Y, 'r');
xlabel('X(Domain)');
ylabel('Y(Domain)');
title('3D - Plot');

% plot(x, u(:, :, 26));


X =

  Columns 1 through 7

   -1.0000   -0.9800   -0.9600   -0.9400   -0.9200   -0.9000   -0.8800

  Columns 8 through 14

   -0.8600   -0.8400   -0.8200   -0.8000   -0.7800   -0.7600   -0.7400

  Columns 15 through 21

   -0.7200   -0.7000   -0.6800   -0.6600   -0.6400   -0.6200   -0.6000
```

Columns 22 through 28

  -0.5800   -0.5600   -0.5400   -0.5200   -0.5000   -0.4800   -0.4600

Columns 29 through 35

  -0.4400   -0.4200   -0.4000   -0.3800   -0.3600   -0.3400   -0.3200

Columns 36 through 42

  -0.3000   -0.2800   -0.2600   -0.2400   -0.2200   -0.2000   -0.1800

Columns 43 through 49

  -0.1600   -0.1400   -0.1200   -0.1000   -0.0800   -0.0600   -0.0400

Columns 50 through 56

  -0.0200   0   0.0200   0.0400   0.0600   0.0800   0.1000

Columns 57 through 63

   0.1200   0.1400   0.1600   0.1800   0.2000   0.2200   0.2400

Columns 64 through 70

   0.2600   0.2800   0.3000   0.3200   0.3400   0.3600   0.3800

Columns 71 through 77

   0.4000   0.4200   0.4400   0.4600   0.4800   0.5000   0.5200

Columns 78 through 84

   0.5400   0.5600   0.5800   0.6000   0.6200   0.6400   0.6600

Columns 85 through 91

   0.6800   0.7000   0.7200   0.7400   0.7600   0.7800   0.8000

Columns 92 through 98

   0.8200   0.8400   0.8600   0.8800   0.9000   0.9200   0.9400
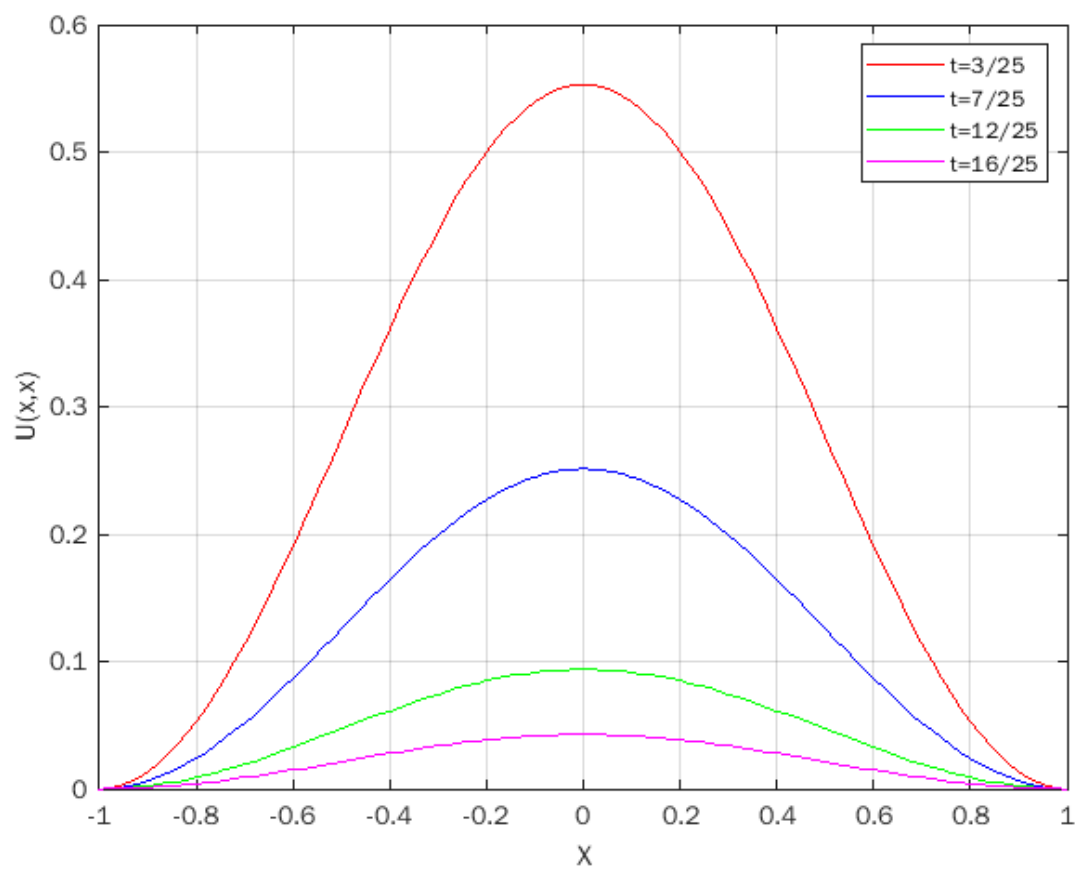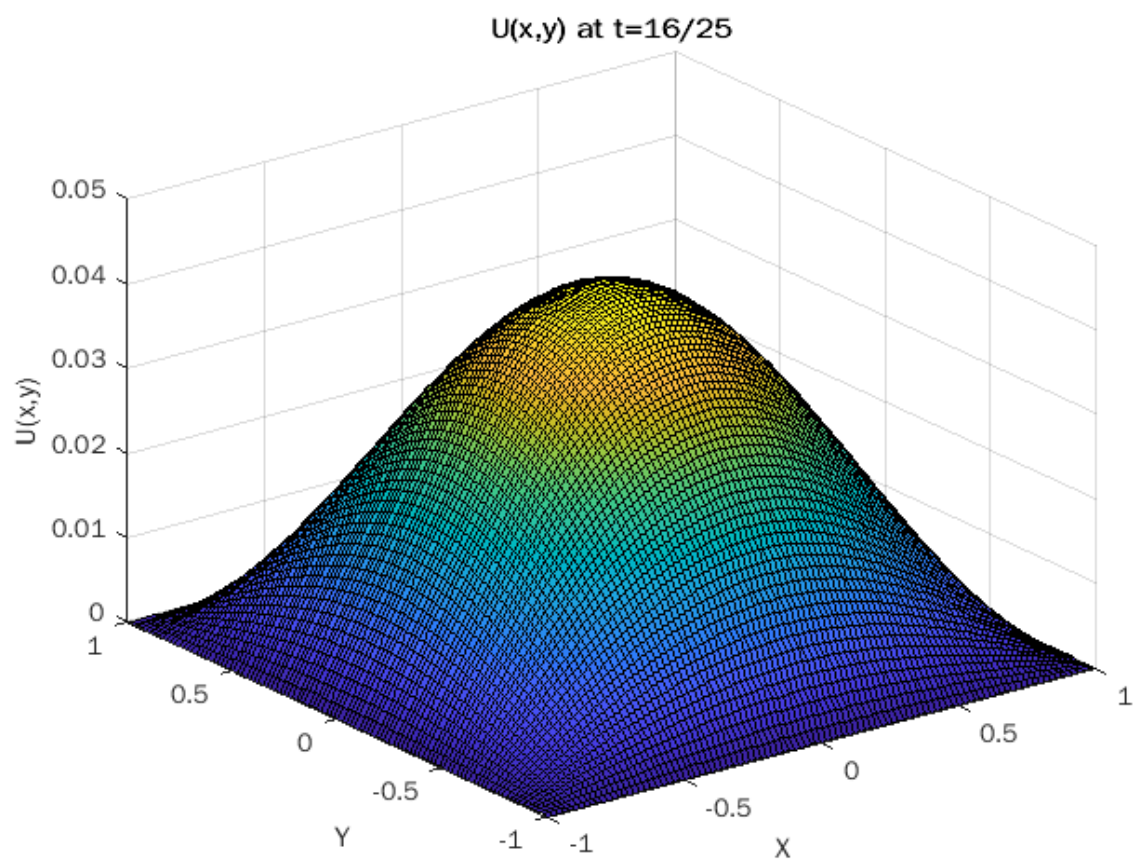
Columns 99 through 101

   0.9600   0.9800   1.0000

Y =

Columns 1 through 7
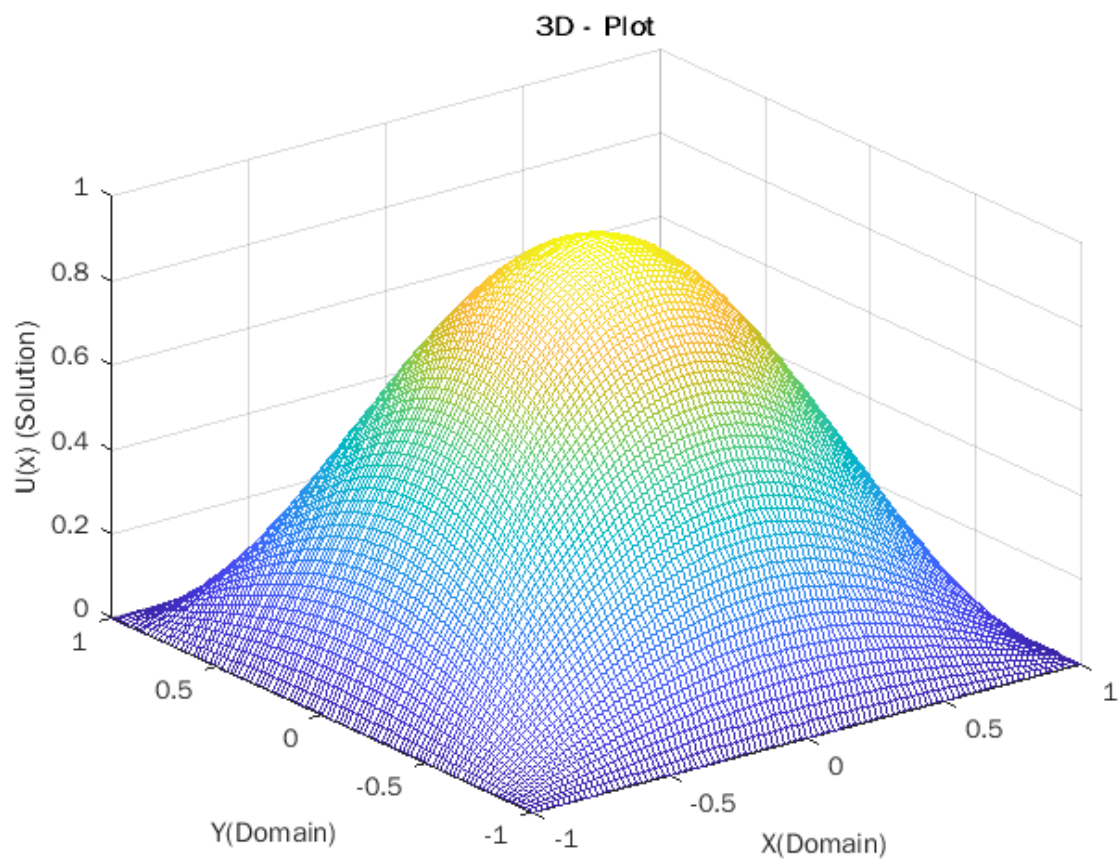
```
  -1.0000    -0.9800    -0.9600    -0.9400    -0.9200    -0.9000    -0.8800

Columns 8 through 14

  -0.8600    -0.8400    -0.8200    -0.8000    -0.7800    -0.7600    -0.7400

Columns 15 through 21

  -0.7200    -0.7000    -0.6800    -0.6600    -0.6400    -0.6200    -0.6000

Columns 22 through 28

  -0.5800    -0.5600    -0.5400    -0.5200    -0.5000    -0.4800    -0.4600

Columns 29 through 35

  -0.4400    -0.4200    -0.4000    -0.3800    -0.3600    -0.3400    -0.3200

Columns 36 through 42

  -0.3000    -0.2800    -0.2600    -0.2400    -0.2200    -0.2000    -0.1800

Columns 43 through 49

  -0.1600    -0.1400    -0.1200    -0.1000    -0.0800    -0.0600    -0.0400

Columns 50 through 56

  -0.0200         0     0.0200     0.0400     0.0600     0.0800     0.1000

Columns 57 through 63

   0.1200     0.1400     0.1600     0.1800     0.2000     0.2200     0.2400

Columns 64 through 70

   0.2600     0.2800     0.3000     0.3200     0.3400     0.3600     0.3800

Columns 71 through 77

   0.4000     0.4200     0.4400     0.4600     0.4800     0.5000     0.5200

Columns 78 through 84

   0.5400     0.5600     0.5800     0.6000     0.6200     0.6400     0.6600

Columns 85 through 91

   0.6800     0.7000     0.7200     0.7400     0.7600     0.7800     0.8000

Columns 92 through 98

   0.8200     0.8400     0.8600     0.8800     0.9000     0.9200     0.9400
```

0.9600   0.9800   1.0000

U(x,y) at t=16/25

3D - Plot

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