

```
% Sample 11
```

```
L = 1;  
T = .2;  
a = 1;  
f = @(x,t) 0;  
u0 = @(x) sin(pi*x);  
gleft = @(t) 0;  
gright = @(t) 0;  
nx = 13;  
nt = 97;  
u = heat1(f, u0, gleft, gright, a, nx, nt, L, T);  
hx = L/(nx-1);  
ht = T/(nt-1);  
x = 0 : hx : L;  
t = 0 : ht : T;  
surf(x, t, u');  
axis([0 1 0 .2 0 1]);  
set(gca,'xtick', 0 : .2 : 1);  
set(gca,'ytick', 0 : .05 : .2);  
set(gca,'ztick', 0 : .2 : 1);  
xlabel('x');  
ylabel('t');  
zlabel('u');  
title('Sample 11');
```

```
% function heat1
```

```
function u = heat1(f, u0, gleft, gright, a, nx, nt, L, T)  
hx = L/(nx-1);  
ht = T/(nt-1);  
u = zeros(nx, nt);  
for(i = 1 : nx)  
    u(i,1) = u0( (i-1)*hx );  
end  
for(k = 2 : nt)  
    u(1,k) = gleft( (k-1)*ht );  
    u(nx,k) = gright( (k-1)*ht );  
end  
for(k = 2 : nt)  
    for(i = 2 : nx-1)  
        u(i,k) = ht*a/hx^2*( u(i-1,k-1) - 2*u(i,k-1) + u(i+1,k-1) ) ...  
            + ht * f( (i-1)*hx, (k-2)*ht ) + u(i,k-1);  
    end  
end
```