

## HW4

1.(a)

```
f = matrix(500,500);
g = matrix(500,500);
h = 2.0/500;
for (i = 0;i<500;i++)
  for(j = 0;j<500;j++)
  {
    f[i][j] = 0.7;
  }

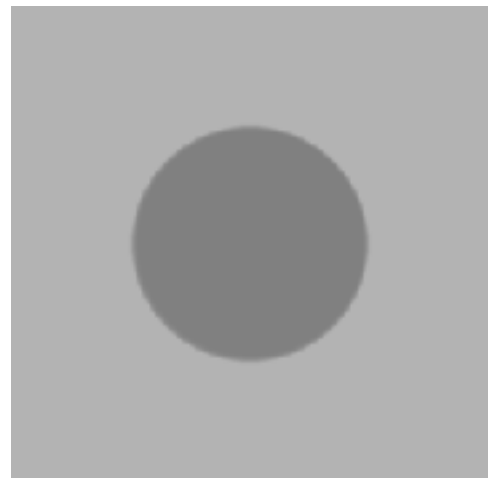
for (i = 0;i<500;i++)
  for(j = 0;j<500;j++)
  {
    if (((0.5+i)*h-1)*((0.5+i)*h-1)+((0.5+j)*h-1)*((0.5+j)*h-1) <= 0.25)
      g[i][j] = 1;
    else
      g[i][j] = 0;
  }

for (i = 0;i<500;i++)
  for(j = 0;j<500;j++)
  {
    if (g[i][j] == 1)
      f[i][j] = 0.5;
  }
```



← (a)

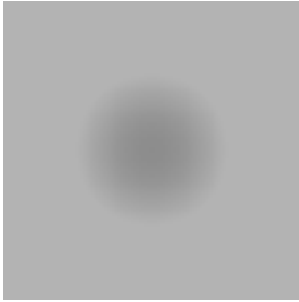
→ (b)



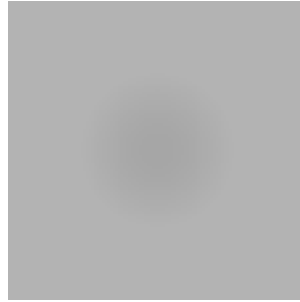
(b)

```
for(k = 0; k < 10; k++)
{
  for (i = 0;i<500;i++)
    for(j = 0;j<500;j++)
    {
      if (g[i][j] == 1)
        f[i][j] = f[i][j] + (f[i+1][j]-2*f[i][j]+f[i-1][j])/4 + (f[i][j+1]-2*f[i][j]+f[i][j-1])/4;
    }
}
```

(c)  
k = 4000.



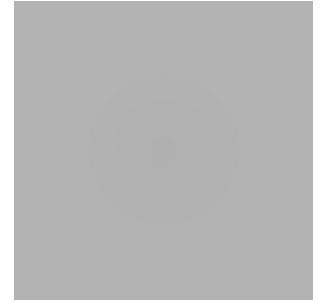
k = 10000.



k = 15000.



k = 20000



2.

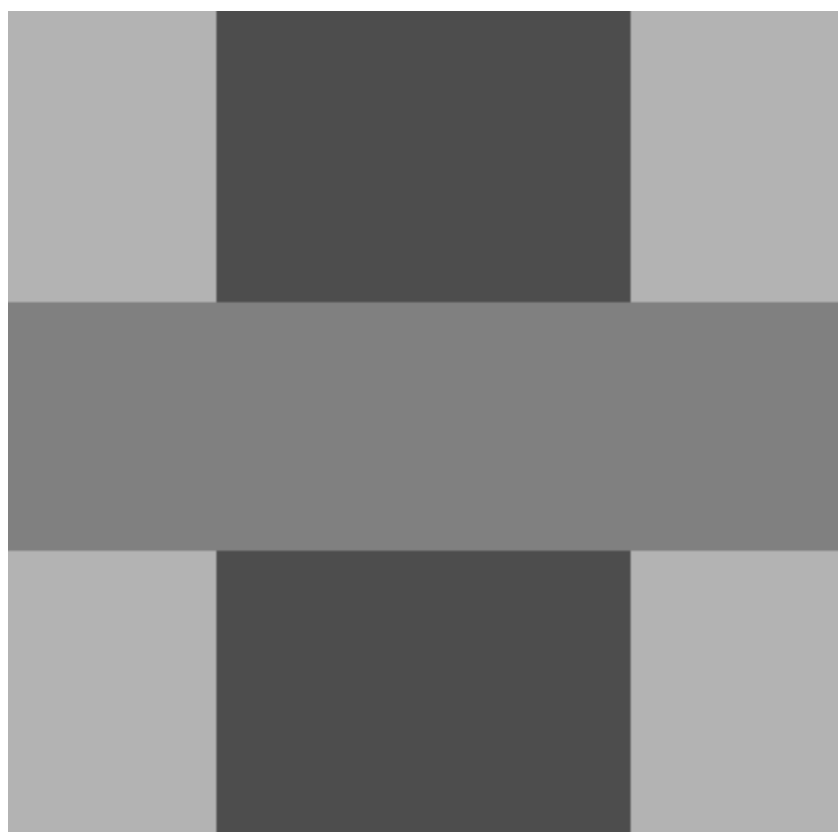
(a)

```
f = matrix(500,500);  
g = matrix(500,500);  
h = 1.0/500;
```

```
for (i = 0;i<500;i++)  
  for(j = 0;j<500;j++)  
  {  
    if ((0.5+i)*h <= 0.75 && (0.5+i)*h >= 0.25)  
      f[i][j] = 0.3;  
    else  
      f[i][j] = 0.7;  
  }
```

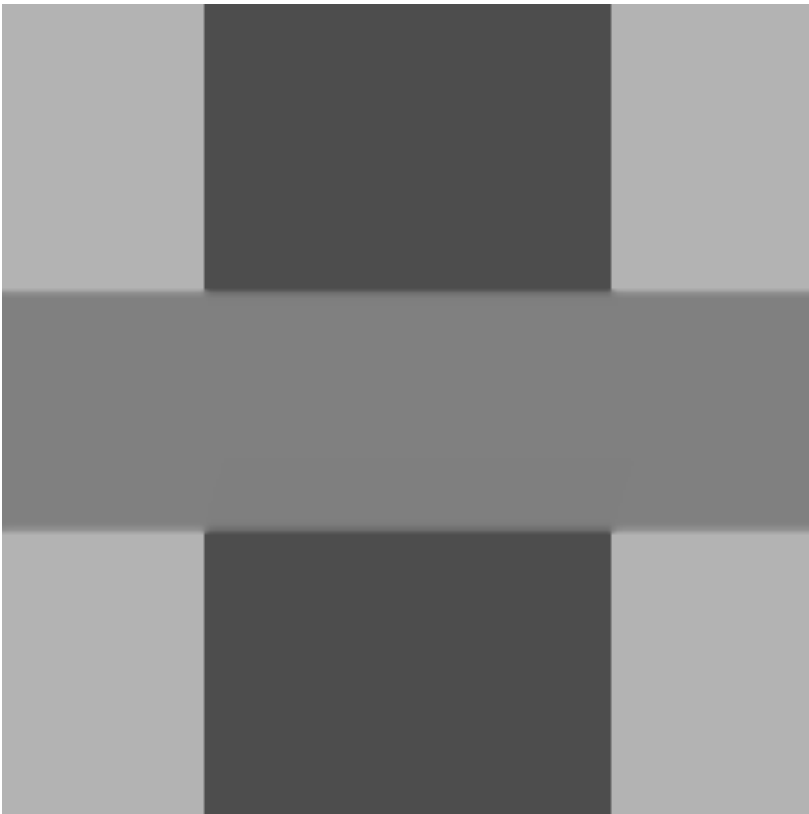
```
for (i = 0;i<500;i++)  
  for(j = 0;j<500;j++)  
  {  
    if ((0.5+j)*h >= 0.35 && (0.5+j)*h <= 0.65)  
      g[i][j] = 1;  
    else  
      g[i][j] = 0;  
  }
```

```
for (i = 0;i<500;i++)  
  for(j = 0;j<500;j++)  
  {  
    if (g[i][j] == 1)  
      f[i][j] = 0.5;  
  }
```

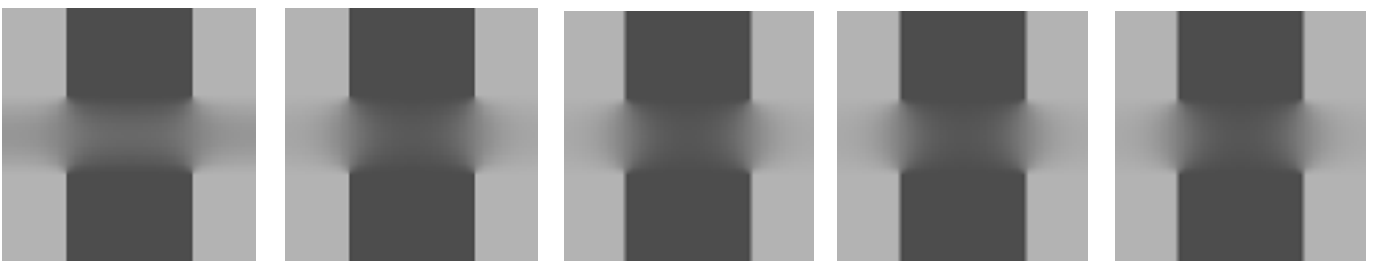


(b)

```
h = matrix(500,500);
for(k = 0; k < 10; k++)
{
  for (i = 0;i<500;i++)
    for(j = 0;j<500;j++)
    {
      if (g[i][j] == 1)
        h[i][j] = (f[min(i+1,499)][j]+f[max(i-1,0)][j]+f[i][min(j+1,499)]+f[i][max(j-1,0)])/4;
    }
  for(i = 0; i<500; i++)
    for(j = 0; j= 500 ; j++)
    {
      if (g[i][j] == 1)
        f[i][j] = h[i][j];
    }
}
```



(c)



k = 4000.

( k = 10000. )

k = 20000.

k = 40000.

k = 100000.

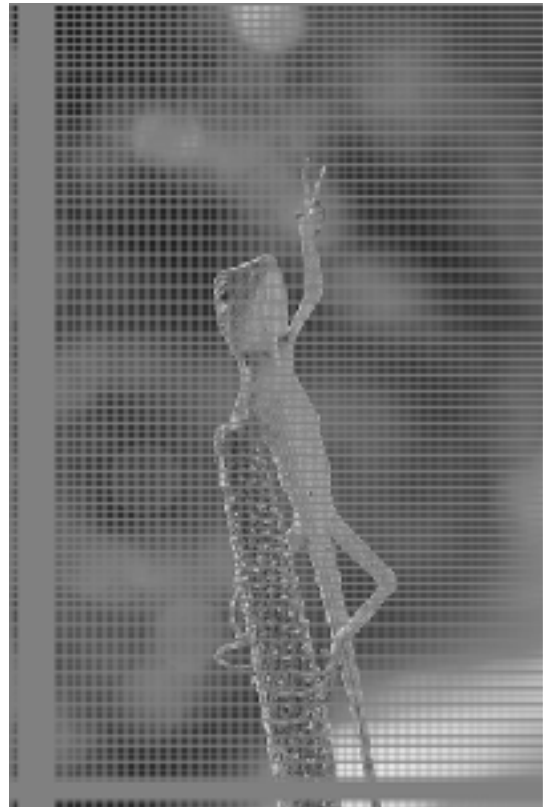
3.

(a)

```
g = matrix(width,height);

for (i = 0;i<width;i++)
  for(j = 0;j<height;j++)
  {
    if (i/4 - double(i)/4 == 0 || j/9 - double(j)/9 ==
0 || (j+1)/9 - double(j+1)/9 == 0 || (j+2)/9 -
double(j+2)/9 == 0 || (i>=10 && i<=50) || (j>=10 &&
j<=30))
      g[i][j] = 1;
    else
      g[i][j] = 0;
  }

for (i = 0;i<width;i++)
  for(j = 0;j<height;j++)
  {
    if (g[i][j] == 1)
      f[i][j] = 0.5;
  }
```



(b)

k = 4000.

k = 10000.

