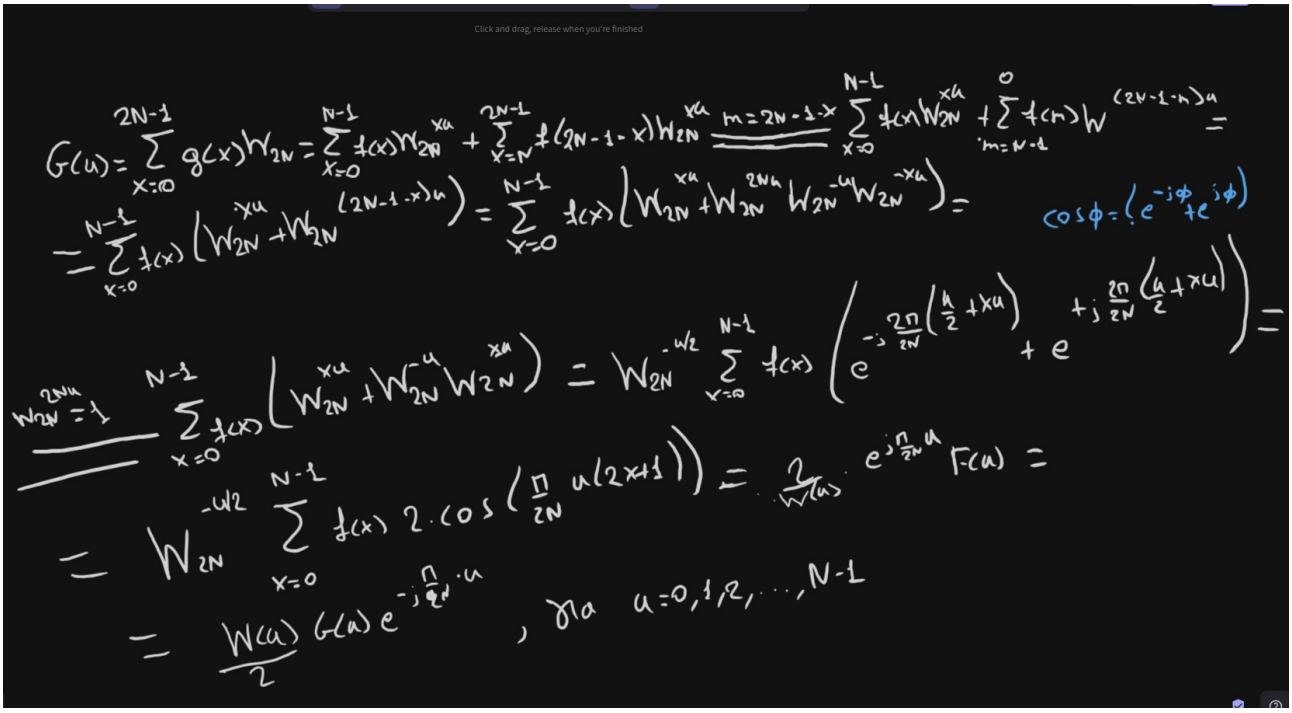
ΜΕΡΟΣ 1

Ερώτημα 1

Η μαθηματικη Αποδειξη:



Ερώτημα 2

part_one.m | mydct.m | mydct2.m

```
function F = mydct(f)
% Metatrepw to f se sthlh gia na douleuw panta me sthlh
f = f(:);
N = length(f);

% Theloume h g na einai h f kai h anapodh f
g = [f; flip(f)];

G=fft(g);

w_0=1/sqrt(N);
w_greater=sqrt(2)/sqrt(N);
for u=1:N
    F(u)=G(u)*exp(-j*pi*(u-1)/(2*N));
    if u==1
        F(u)=F(u)*w_0/2;
    else
        F(u)=F(u)*w_greater/2;
    end
end

end
```

Ερώτημα 3


mydct.m
mydct2.m
function F = mydct2(f)
rows = size(f,1);
columns = size(f,2);
% DCT se kathe grammh
for w=1:rows
nf(w,:) = mydct(f(w,:)).'; % Transpose gia na ginei ksana sei
end
% DCT se kathe sthlh
for w=1:columns
F(:,w) = mydct(nf(:,w));
end
end

Ερώτημα 4

```
part_one.m   ×  |   mydct.m   ×  |   mydct2.m   ×
clear;

A = [ 1     9     17     25     -33     41     49     57;
      2     1     8      2      4       2      50     58;
      2     10    18     26     34      2      0      8;
      -2    15    18     26     34      2      0      58;
      0     1     18     26     34      40     5      5;
      2     1     18     26     14      19     5      8;
      2     0     8      26     2       42     0      5;
      2     1     8      26     4       4      0      58;
    ];

result_one = mydct2(A)
result_two = dct2(A)

% Sygkrinoume th diafora
diff = result_one - result_two;
disp(max(abs(diff(:))));
```

```
octave:4> part_one
result_one =

   119.2500 +       0i   -54.1605 +   0.0000i    -9.6158 +   0.0000i   -36.0808 -   0.0000i    16.2500 +   0.0000i    -0.1630 -   0.0000i    18.5953 +   0.0000i   -22.9164 -   0.0000i
    18.5425 +   0.0000i   -24.6043 +   0.0000i    32.5545 +   0.0000i   -13.9155 -   0.0000i   -15.8537 -   0.0000i    11.0636 +   0.0000i   -15.5476 -   0.0000i    11.0531 +   0.0000i
    -0.5112 -   0.0000i   -28.4547 +   0.0000i    48.3005 +       0i   -15.5545 -   0.0000i   -15.4518 +       0i    26.3929 -   0.0000i     5.1930 +   0.0000i   -23.2009 +       0i
     4.4372 +   0.0000i    -7.0215 +   0.0000i    -3.7716 -   0.0000i    20.1821 +   0.0000i   -35.2870 -   0.0000i    25.6450 +   0.0000i    13.4060 +       0i   -18.9336 -   0.0000i
    18.0000 +       0i   -16.1397 +   0.0000i    12.5012 -   0.0000i   -17.5758 -   0.0000i     7.0000 +   0.0000i    -7.8741 -   0.0000i     8.6223 +   0.0000i   -13.6281 -   0.0000i
     2.3805 +   0.0000i     9.9076 +   0.0000i    -7.3007 +   0.0000i    -1.7419 +   0.0000i    -4.6151 -   0.0000i    -2.1959 +   0.0000i     7.7902 -   0.0000i   -20.1112 -   0.0000i
    -3.8472 -   0.0000i    18.5763 +   0.0000i   -11.5570 +   0.0000i    -7.4778 -   0.0000i     4.5061 -   0.0000i     1.6213 +   0.0000i    -1.5505 +       0i    -0.9455 +   0.0000i
    -4.7377 +   0.0000i    16.1662 +   0.0000i   -30.7670 -   0.0000i    28.5261 +   0.0000i   -15.9159 -   0.0000i     7.1105 -   0.0000i     8.1046 +   0.0000i    -9.3819 -   0.0000i

result_two =

   119.2500   -54.1605    -9.6158   -36.0808    16.2500    -0.1630    18.5953   -22.9164
    18.5425   -24.6043    32.5545   -13.9155   -15.8537    11.0636   -15.5476    11.0531
    -0.5112   -28.4547    48.3005   -15.5545   -15.4518    26.3929     5.1930   -23.2009
     4.4372    -7.0215    -3.7716    20.1821   -35.2870    25.6450    13.4060   -18.9336
    18.0000   -16.1397    12.5012   -17.5758     7.0000    -7.8741     8.6223   -13.6281
     2.3805     9.9076    -7.3007    -1.7419    -4.6151    -2.1959     7.7902   -20.1112
    -3.8472    18.5763   -11.5570    -7.4778     4.5061     1.6213    -1.5505    -0.9455
    -4.7377    16.1662   -30.7670    28.5261   -15.9159     7.1105     8.1046    -9.3819

1.4233e-14
octave:5>
```

ΜΕΡΟΣ 2

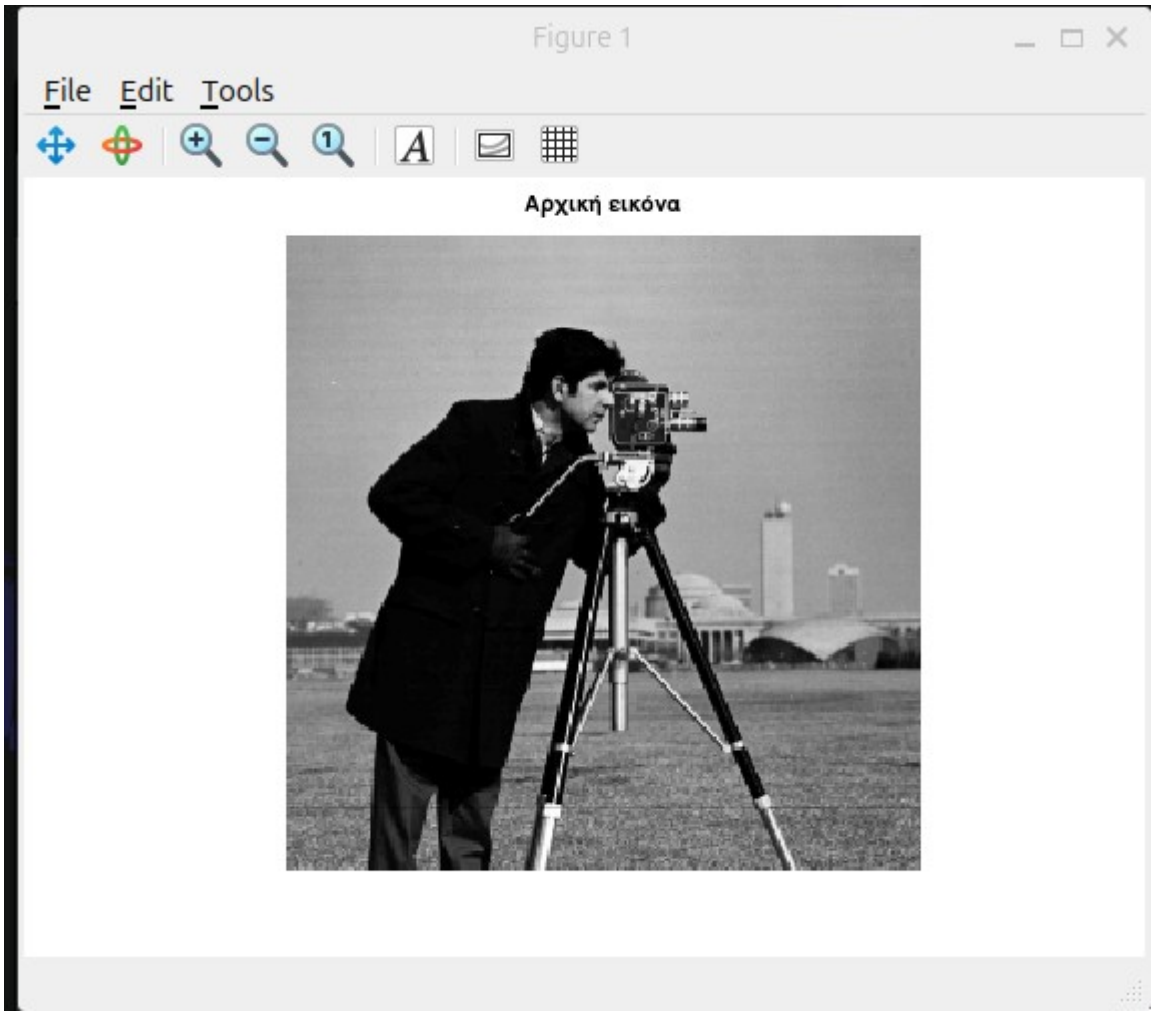


Figure 1
File Edit Tools
Αρχική εικόνα

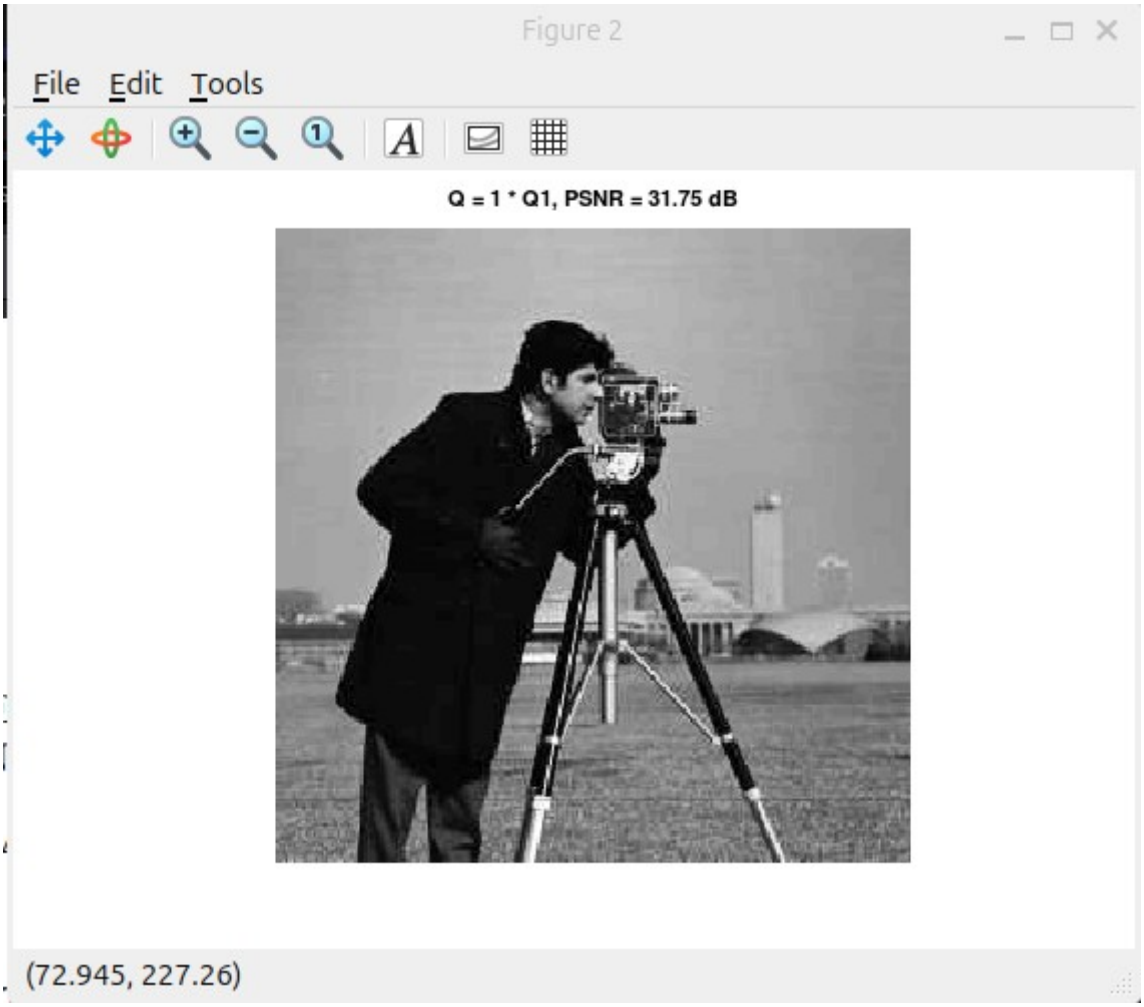


Figure 2
File Edit Tools
Q = 1 * Q1, PSNR = 31.75 dB
(72.945, 227.26)


Figure 3
File Edit Tools
Q = 2 * Q1, PSNR = 29.31 dB
(47.913, 61.727)

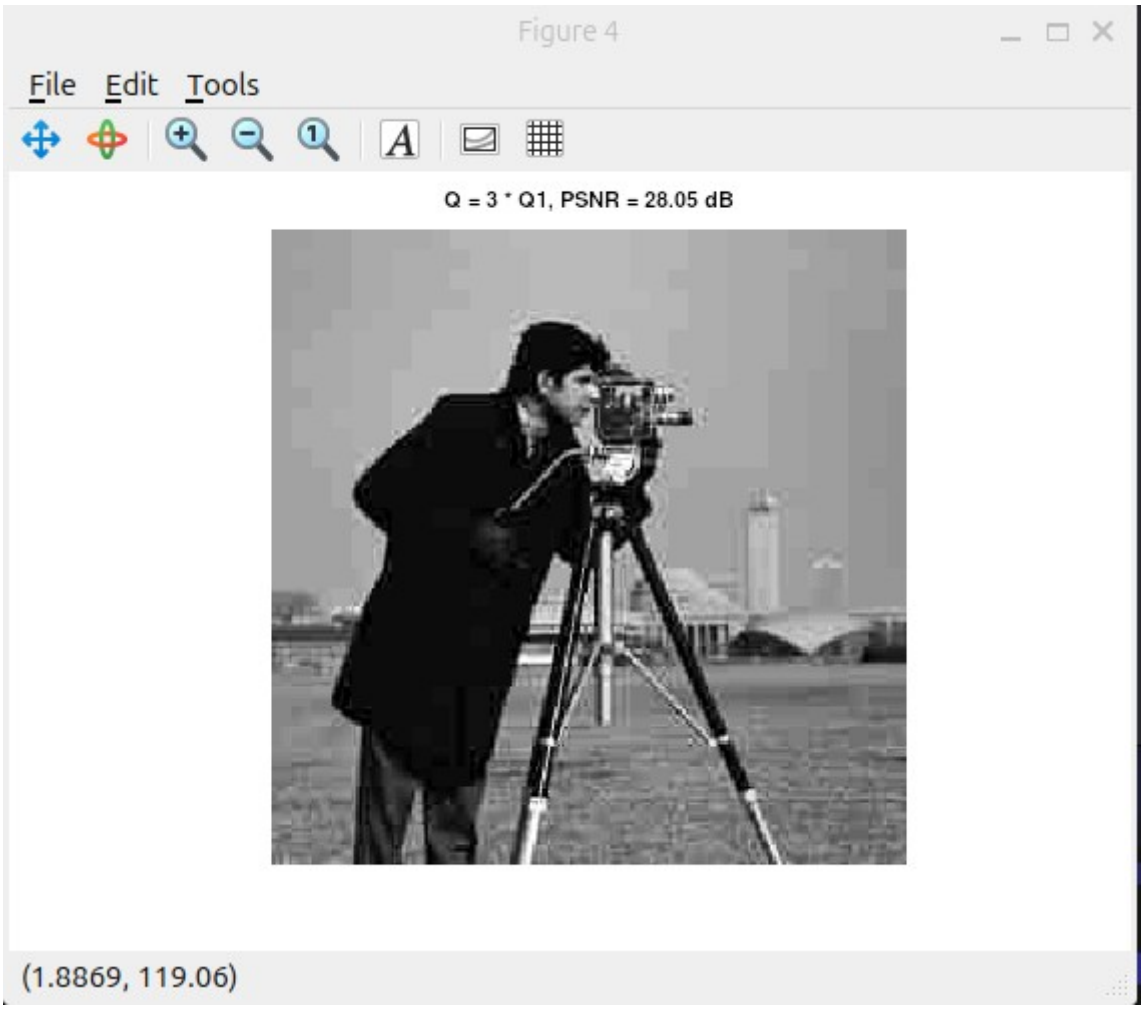


Figure 4
File Edit Tools
Q = 3 * Q1, PSNR = 28.05 dB
(1.8869, 119.06)

```
Entropy of original image: 7.0097

==============================
Q = 1 * Q1
==============================
Entropy of |F_hat(u,v)|: 0.6042
Number of zero coefficients: 55852
PSNR: 31.7487 dB

==============================
Q = 2 * Q1
==============================
Entropy of |F_hat(u,v)|: 0.4510
Number of zero coefficients: 59349
PSNR: 29.3111 dB

==============================
Q = 3 * Q1
==============================
Entropy of |F_hat(u,v)|: 0.3749
Number of zero coefficients: 60789
PSNR: 28.0489 dB
octave:5>
```