# Code

## Problem c)

```
N = 100;

T = linspace(.1,20, N);

C_v = zeros(N);

for i = 1:N-1
    C_v(i) = (3*exp(1/T(i))) / ((T(i)^2)*(1+3*exp(1/T(i)))^2);
end

plot(T, C_v)
xlabel('T');
ylabel('C_v');

pause()
```

## Problem e)

```
N = 100;

Ttheta = [0.01 0.025 0.1 0.5 0.75 1.0];
C = ['-r' '-g' '-b' 'c' 'm' 'y'];

F = zeros(N);

for i=1:length(Ttheta)
    j = linspace(1,20,N);
    F = (2*j + 1).*exp(-j.*(j + 1)*Ttheta(i));
    plot(j, F, C(i))
    hold on
end

xlabel('j')
ylabel('T/\theta_r')
legend('T/\theta=0.01','T/\theta0.025', 'T/\=theta0.1','T/\theta
    =0.5','T/\theta=0.75','T/\theta=1.0')

pause()
```

## Problem j)

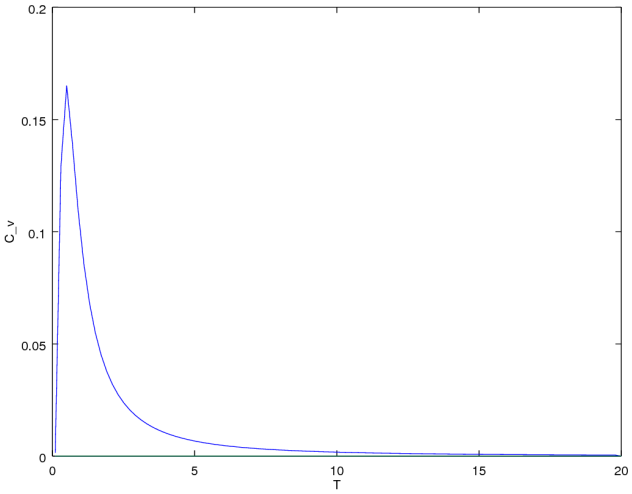
```
u = (0.01:0.01:3.0);

Z = zeros(length(u),1);

j = linspace(0,1000, 1000);

for i = 1:length(u)
    Z(i) = sum( (2*j + 1).*exp(-(j.*(j + 1))/u(i)));
end

plot(u,Z,'-b');
```

```
hold on
plot(u,u,'-r');
xlabel('T/\theta_r');
ylabel('Z');

pause();
```

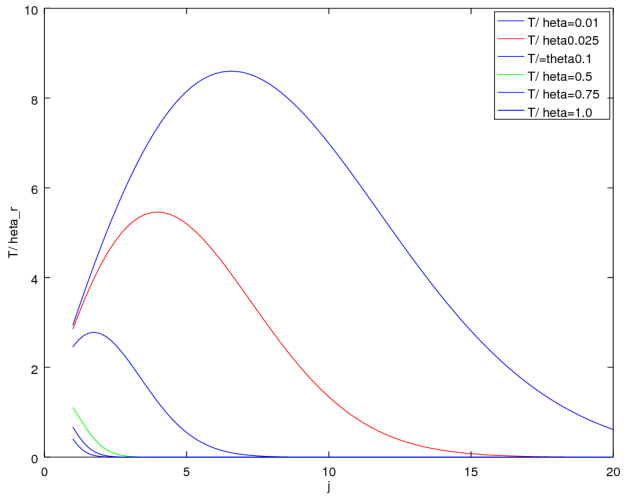
## Problem n)

```
% Calculate partition function Z
u = (0.01:0.01:3.0);

Z = zeros(length(u),1);

j = linspace(0,1000, 1001);

for i = 1:length(u)
    Z(i) = sum( (2*j + 1).*exp(-(j.*(j + 1))/u(i)));
end

% User Z as partition function
du = u(2:end)-u(1:end-1);
u_1 = (u(1:end-1)+u(2:end))*0.5;

logZ = log(Z);

U = u_1.^2.*diff(logZ)'./du;
ddu = 0.5*(du(1:end-1)+du(2:end));
CV = diff(U)./ddu;
u2 = u(2:end-1);

%plot(u_1,U);
%xlabel('u')
%ylabel('U(u)')

plot(u2,CV);
xlabel('u')
ylabel('C_V(u)');

pause();
```

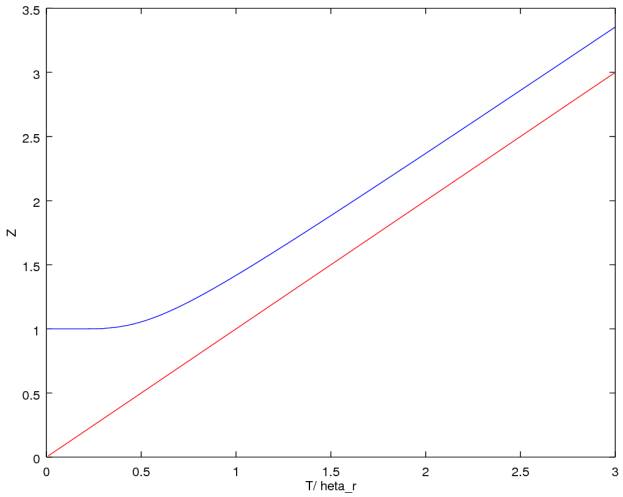
# Plot



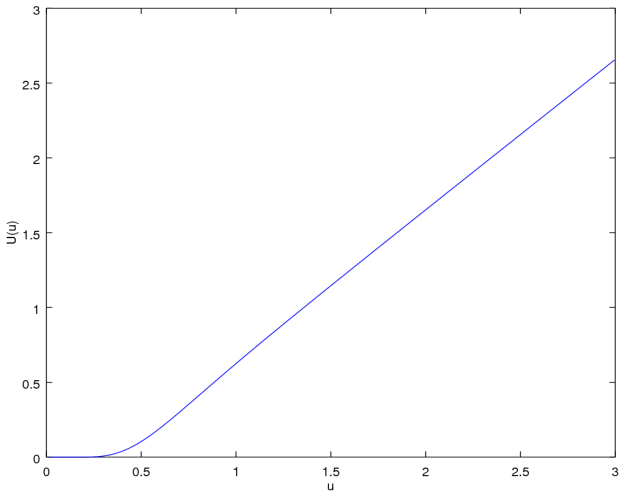

Figur 1: Plot from problem c)



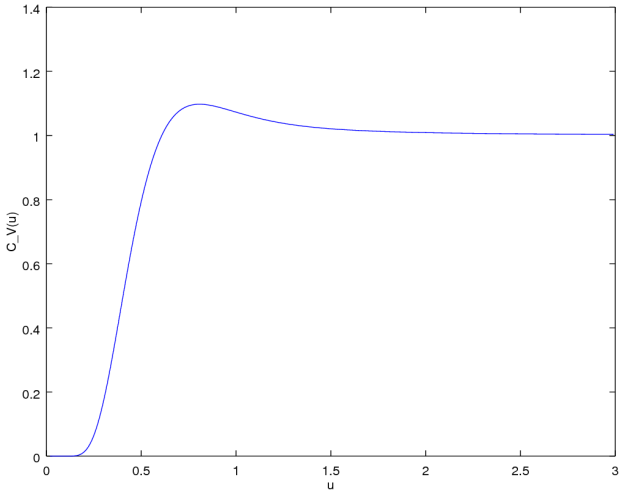

Figur 2: Plot from problem e)




Figur 3: Plot from problem j)




Figur 4: Plot from problem n)




Figur 5: Plot from problem n)