1

```
F = input('Function : ','s');
f = str2func(['@(x)',F]);
x0 = input('Enter current solution : ');
d = input('Enter step-size vector : ');
x1 = explo(f,x0,d)
```

```
Exploration on variables:
Exploration in way 1: X=[0.00000.0000] X+=[0.50000.0000]  X-=[-0.5000 0.0000]
f+ = 157.812500, f- = 171.812500, f = 170.000000
Exploration in way 2: X=[0.50000.0000] X+=[0.50000.5000]  X-=[0.5000-0.5000]
f+ = 144.125000, f- = 165.625000, f = 157.812500
x1 = 1×2
    0.5000    0.5000
```

2

```
xp = Patternmove(x1,x0)
```

```
xp = 1×2
     1     1
```

```
fprintf('Pattern point: [%s]', num2str(xp, '%4f'));
```

```
Pattern point: [1.0000001.000000]
```

```
x2 = explo(f, xp, d)
```

```
Exploration on variables:
Exploration in way 1: X=[1.00001.0000] X+=[1.50001.0000]  X-=[0.50001.0000]
f+ = 80.312500, f- = 125.312500, f = 106.000000
Exploration in way 2: X=[1.50001.0000] X+=[1.50001.5000]  X-=[1.50000.5000]
f+ = 63.125000, f- = 95.625000, f = 80.312500
x2 = 1×2
    1.5000    1.5000
```

```
fprintf('Explored point : [%s]', num2str(x2, '%4f'));
```

```
Explored point : [1.5000001.500000]
```

3

```
clc;
clear;

F = input('Function : ','s');
f = str2func(['@(x)', F]);

Xb = input('Enter initial point : ');
D  = input('Enter delta value : ');
alpha = input('Enter reduction parameter : ');
e = input('Enter tolerance : ');

fprintf('\nStarting Hooke-Jeeves Pattern Search...\n');
```

```
Starting Hooke-Jeeves Pattern Search...
```

```
n = length(Xb);
iteration = 0;

while true
    iteration = iteration + 1;
    fprintf('            Iteration %d\n', iteration);
    fprintf('-------------------------------------\n');
    fprintf('\nExploration around [%s]\n', num2str(Xb, '%.4f '));
    Xe = explo(f, Xb, D);
    fprintf('Base point Xb = [%s], f(Xb) = %.6f\n', num2str(Xb, '%.4f '), f(Xb));
    fprintf('Explored point Xe = [%s], f(Xe) = %.6f\n', num2str(Xe, '%.4f '),
f(Xe));
    if f(Xe) < f(Xb)
        fprintf('\nExploration successful - proceed to pattern move.\n');
        while true
            Xp = Xe + (Xe - Xb);
            fprintf('\nPattern point Xp = [%s], f(Xp) = %.6f\n', num2str(Xp, '%.4f
'), f(Xp));
            Xn = explo(f, Xp, D);
            fprintf('Explored around pattern: Xn = [%s], f(Xn) = %.6f\n',
num2str(Xn, '%.4f '), f(Xn));
            if f(Xn) < f(Xe)
                fprintf('\nImprovement found after pattern - continue pattern
sequence.\n');
                Xb = Xe;
                Xe = Xn;
            else
                fprintf('\nNo further improvement - pattern sequence ends.\n');
                Xb = Xe;
                break;
            end
        end

    else
        fprintf('\nExploration failed - reduce step size.\n');
    end

    if f(Xe) >= f(Xb)
        D = D / alpha;
        fprintf('\nReducing step size. New D = [%s]\n', num2str(D, '%.4f '));

        if norm(D) < e
            fprintf('\nTermination: norm(D) < %.5f\n', e);
            fprintf('Approximate minimum point: X = [%s], f(X)=%.6f\n', num2str(Xb,
'%.4f '), f(Xb));
            break;
        end
```

```
    end
end
```

```
           Iteration 1
-----------------------------------
Exploration around [0.0000 0.0000]
Exploration on variables:
Exploration in way 1: X=[0.00000.0000] X+=[0.50000.0000]  X-=[-0.5000 0.0000]
f+ = 157.812500, f- = 171.812500, f = 170.000000
Exploration in way 2: X=[0.50000.0000] X+=[0.50000.5000]  X-=[0.5000-0.5000]
f+ = 144.125000, f- = 165.625000, f = 157.812500
Base point Xb = [0.0000 0.0000], f(Xb) = 170.000000
Explored point Xe = [0.5000 0.5000], f(Xe) = 144.125000
Exploration successful – proceed to pattern move.
Pattern point Xp = [1.0000 1.0000], f(Xp) = 106.000000
Exploration on variables:
Exploration in way 1: X=[1.00001.0000] X+=[1.50001.0000]  X-=[0.50001.0000]
f+ = 80.312500, f- = 125.312500, f = 106.000000
Exploration in way 2: X=[1.50001.0000] X+=[1.50001.5000]  X-=[1.50000.5000]
f+ = 63.125000, f- = 95.625000, f = 80.312500
Explored around pattern: Xn = [1.5000 1.5000], f(Xn) = 63.125000
Improvement found after pattern – continue pattern sequence.
Pattern point Xp = [2.5000 2.5000], f(Xp) = 8.125000
Exploration on variables:
Exploration in way 1: X=[2.50002.5000] X+=[3.00002.5000]  X-=[2.00002.5000]
f+ = 5.312500, f- = 21.812500, f = 8.125000
Exploration in way 2: X=[3.00002.5000] X+=[3.00003.0000]  X-=[3.00002.0000]
f+ = 26.000000, f- = 0.000000, f = 5.312500
Explored around pattern: Xn = [3.0000 2.0000], f(Xn) = 0.000000
Improvement found after pattern – continue pattern sequence.
Pattern point Xp = [4.5000 2.5000], f(Xp) = 152.125000
Exploration on variables:
Exploration in way 1: X=[4.50002.5000] X+=[5.00002.5000]  X-=[4.00002.5000]
f+ = 290.312500, f- = 66.812500, f = 152.125000
Exploration in way 2: X=[4.00002.5000] X+=[4.00003.0000]  X-=[4.00002.0000]
f+ = 100.000000, f- = 50.000000, f = 66.812500
Explored around pattern: Xn = [4.0000 2.0000], f(Xn) = 50.000000
No further improvement – pattern sequence ends.
Reducing step size. New D = [0.2500 0.2500]
           Iteration 2
-----------------------------------
Exploration around [3.0000 2.0000]
Exploration on variables:
Exploration in way 1: X=[3.00002.0000] X+=[3.25002.0000]  X-=[2.75002.0000]
f+ = 2.503906, f- = 2.128906, f = 0.000000
Exploration in way 2: X=[3.00002.0000] X+=[3.00002.2500]  X-=[3.00001.7500]
f+ = 1.191406, f- = 0.941406, f = 0.000000
Base point Xb = [3.0000 2.0000], f(Xb) = 0.000000
Explored point Xe = [3.0000 2.0000], f(Xe) = 0.000000
Exploration failed – reduce step size.
Reducing step size. New D = [0.1250 0.1250]
           Iteration 3
-----------------------------------
Exploration around [3.0000 2.0000]
Exploration on variables:
Exploration in way 1: X=[3.00002.0000] X+=[3.12502.0000]  X-=[2.87502.0000]
f+ = 0.601807, f- = 0.554932, f = 0.000000
Exploration in way 2: X=[3.00002.0000] X+=[3.00002.1250]  X-=[3.00001.8750]
f+ = 0.281494, f- = 0.250244, f = 0.000000
Base point Xb = [3.0000 2.0000], f(Xb) = 0.000000
Explored point Xe = [3.0000 2.0000], f(Xe) = 0.000000
Exploration failed – reduce step size.
Reducing step size. New D = [0.0625 0.0625]
Termination: norm(D) < 0.10000
```

```
Approximate minimum point: X = [3.0000 2.0000], f(X)=0.000000
```

```
Xbest = Xb;
disp('\nFinal Result\n');
```

```
\nFinal Result\n
```

```
fprintf('Xbest = [%s], f(Xbest) = %.6f\n', num2str(Xbest, '%.6f '), f(Xbest));
```

```
Xbest = [3.000000 2.000000], f(Xbest) = 0.000000
```

```
fprintf('Total iterations: %d\n', iteration);
```

```
Total iterations: 3
```