

```
% cost_function_1
```

```
% cost_function_1.m
```

```
%  
% This MATLAB m-file evaluates the value and gradient  
% of a simple cost function of two variables.  
%  
% K. Beers  
% MIT ChE  
% 12/6/2001
```

```
function [F,g,iflag] = cost_function_1(x);
```

```
iflag = 0;
```

```
if(length(x) ~= 2)  
    iflag = -1;  
    error('cost_function_1: x has incorrect dim.');  
end
```

```
% First, set the values of the parameters.
```

```
k1 = 5;  
k2 = 1;  
xmin = [0; 0];
```

```
% Calculate the distance and the square of the distance  
% from the input guess to the known minimum.
```

```
distsq = dot(x-xmin,x-xmin);
```

```
% Calculate the cost function.
```

```
F = distsq + k1*(x(1)-xmin(1))^2 + k2*(x(2)-xmin(2))^4;
```

```
% Calculate the gradient.
```

```
g = zeros(2,1);  
g(1) = 2*(x(1)-xmin(1)) + 2*k1*(x(1)-xmin(1));  
g(2) = 2*(x(2)-xmin(2)) + 4*k1*(x(2)-xmin(2))^3;
```

```
iflag = 1;
```

```
return;
```