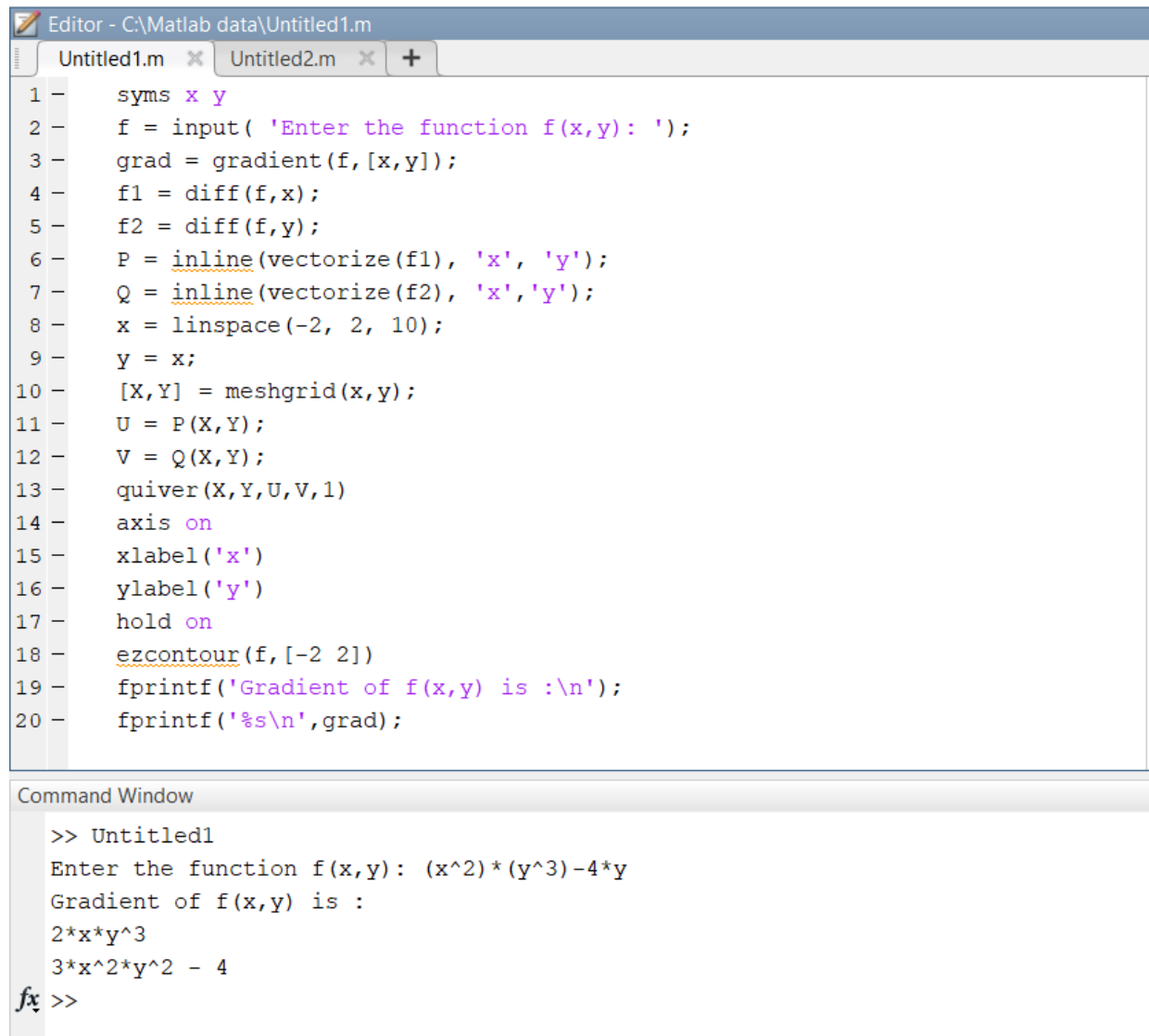


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MATLAB DA 5

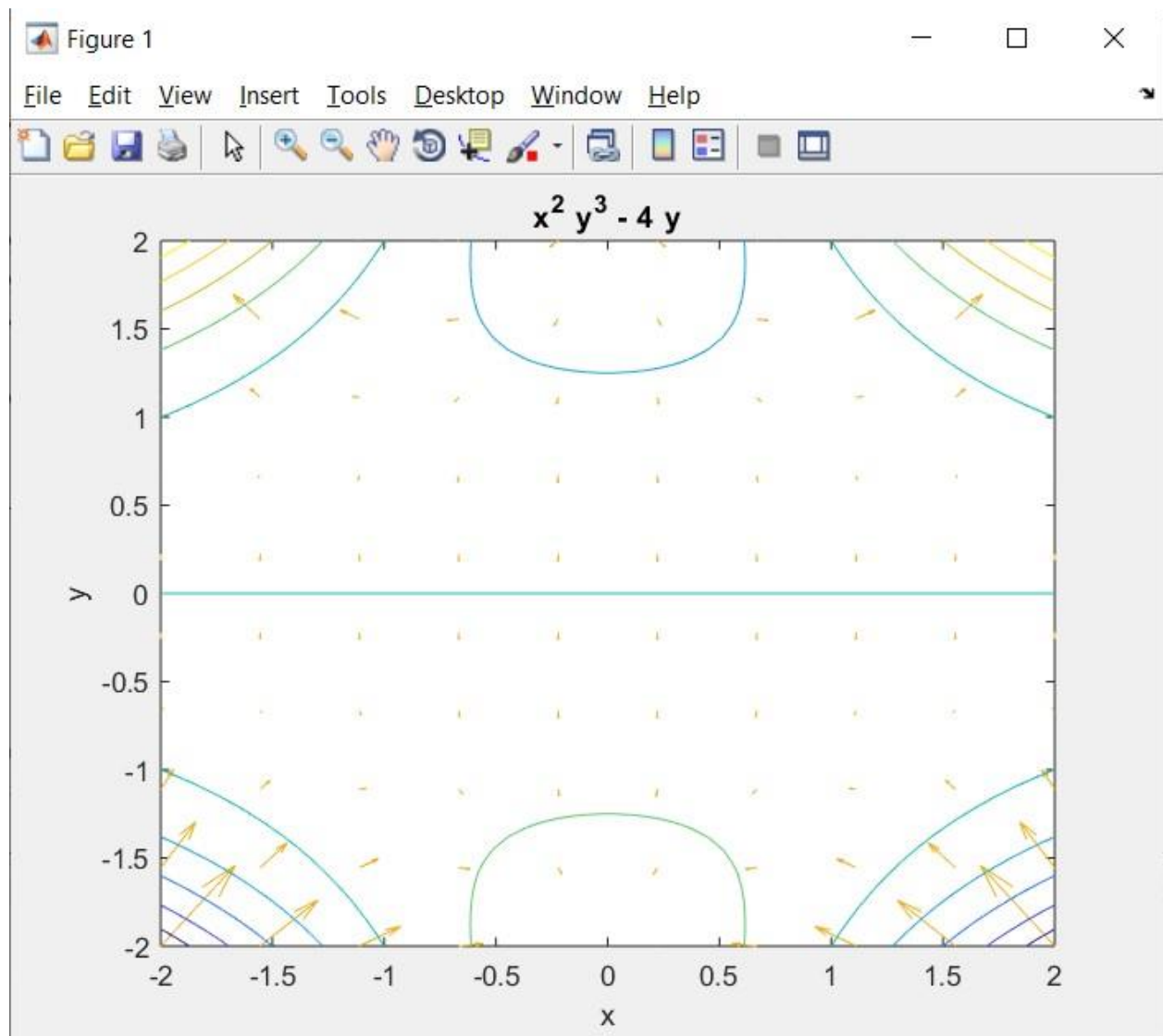
Find the Gradient of the function  $f = x^2y^3 - 4y$  .



The image shows a MATLAB Editor window with a script titled 'Untitled1.m' and a Command Window below it. The script defines a function  $f = x^2y^3 - 4y$  and calculates its gradient. The Command Window shows the user inputting the function and the resulting gradient components.

```
Editor - C:\Matlab data\Untitled1.m
Untitled1.m x Untitled2.m +
1 - syms x y
2 - f = input( 'Enter the function f(x,y): ');
3 - grad = gradient(f, [x,y]);
4 - f1 = diff(f,x);
5 - f2 = diff(f,y);
6 - P = inline(vectorize(f1), 'x', 'y');
7 - Q = inline(vectorize(f2), 'x', 'y');
8 - x = linspace(-2, 2, 10);
9 - y = x;
10 - [X,Y] = meshgrid(x,y);
11 - U = P(X,Y);
12 - V = Q(X,Y);
13 - quiver(X,Y,U,V,1)
14 - axis on
15 - xlabel('x')
16 - ylabel('y')
17 - hold on
18 - ezcontour(f, [-2 2])
19 - fprintf('Gradient of f(x,y) is :\n');
20 - fprintf('%s\n', grad);

Command Window
>> Untitled1
Enter the function f(x,y): (x^2)*(y^3)-4*y
Gradient of f(x,y) is :
2*x*y^3
3*x^2*y^2 - 4
fx >>
```



Find the divergence of a vector field  $f = [xy, x^2]$ .

```
Editor - C:\Matlab data\Untitled2.m
Untitled1.m x  Untitled2.m x  +
1 - clear all
2 - clc
3 - syms x y
4 - x = -4:0.5:4;
5 - y = x;
6 - [X,Y]= meshgrid (x,y);
7 - Div = divergence(X,Y,X.*Y, X.^2);
8 - pcolor(X,Y,Div);
9 - shading interp
10 - hold on;
11 - quiver(X,Y, X.*Y.^2, X.^2, 'Y');
12 - hold off;
13 - xlabel('x')
14 - ylabel('y')
15 - disp(Div)
```

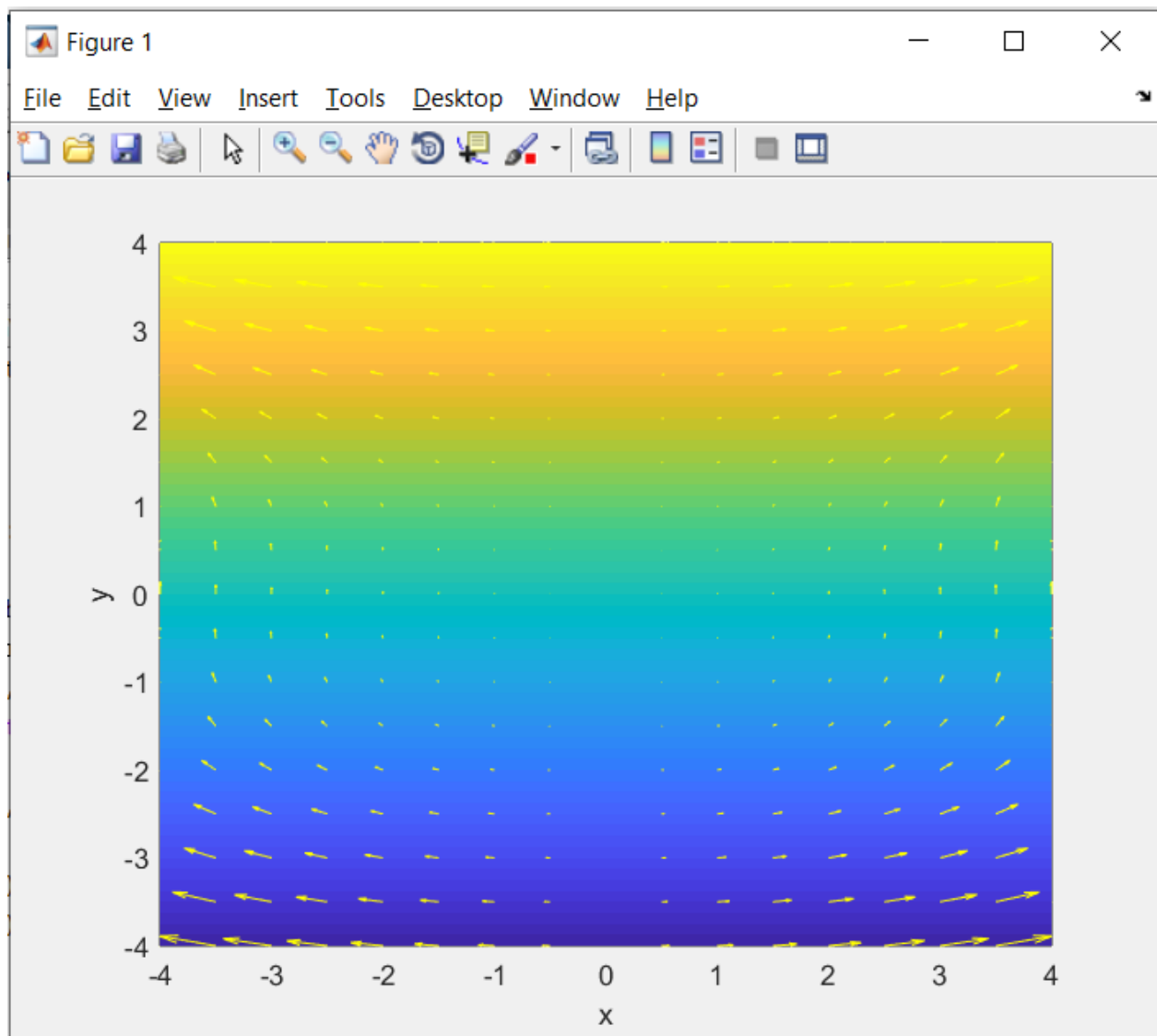
[illegible]

Columns 11 through 17

-4.0000	-4.0000	-4.0000	-4.0000	-4.0000	-4.0000	-4.0000
-3.5000	-3.5000	-3.5000	-3.5000	-3.5000	-3.5000	-3.5000
-3.0000	-3.0000	-3.0000	-3.0000	-3.0000	-3.0000	-3.0000
-2.5000	-2.5000	-2.5000	-2.5000	-2.5000	-2.5000	-2.5000
-2.0000	-2.0000	-2.0000	-2.0000	-2.0000	-2.0000	-2.0000
-1.5000	-1.5000	-1.5000	-1.5000	-1.5000	-1.5000	-1.5000
-1.0000	-1.0000	-1.0000	-1.0000	-1.0000	-1.0000	-1.0000
-0.5000	-0.5000	-0.5000	-0.5000	-0.5000	-0.5000	-0.5000
0	0	0	0	0	0	0
0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000
1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1.5000	1.5000	1.5000	1.5000	1.5000	1.5000	1.5000
2.0000	2.0000	2.0000	2.0000	2.0000	2.0000	2.0000
2.5000	2.5000	2.5000	2.5000	2.5000	2.5000	2.5000
3.0000	3.0000	3.0000	3.0000	3.0000	3.0000	3.0000
3.5000	3.5000	3.5000	3.5000	3.5000	3.5000	3.5000
4.0000	4.0000	4.0000	4.0000	4.0000	4.0000	4.0000

*fx* >> |





Visualize the curl of a vector function  $f = [yz, 3zx, z]$ .

Editor - C:\Matlab data\Untitled3.m

Untitled1.m x Untitled2.m x Untitled3.m x +

```
1 - clear all
2 - clc
3 - syms x y z
4 - V = [y*z, 3*z*x, z];
5 - X = [x y z];
6 - disp(curl(V,X))
7 - [x,y,z] = meshgrid([-1 0 1]);
8 - u = -3*x;
9 - v = y;
10 - w = 2*z;
11 - quiver3(x,y,z,u,v,w);
```

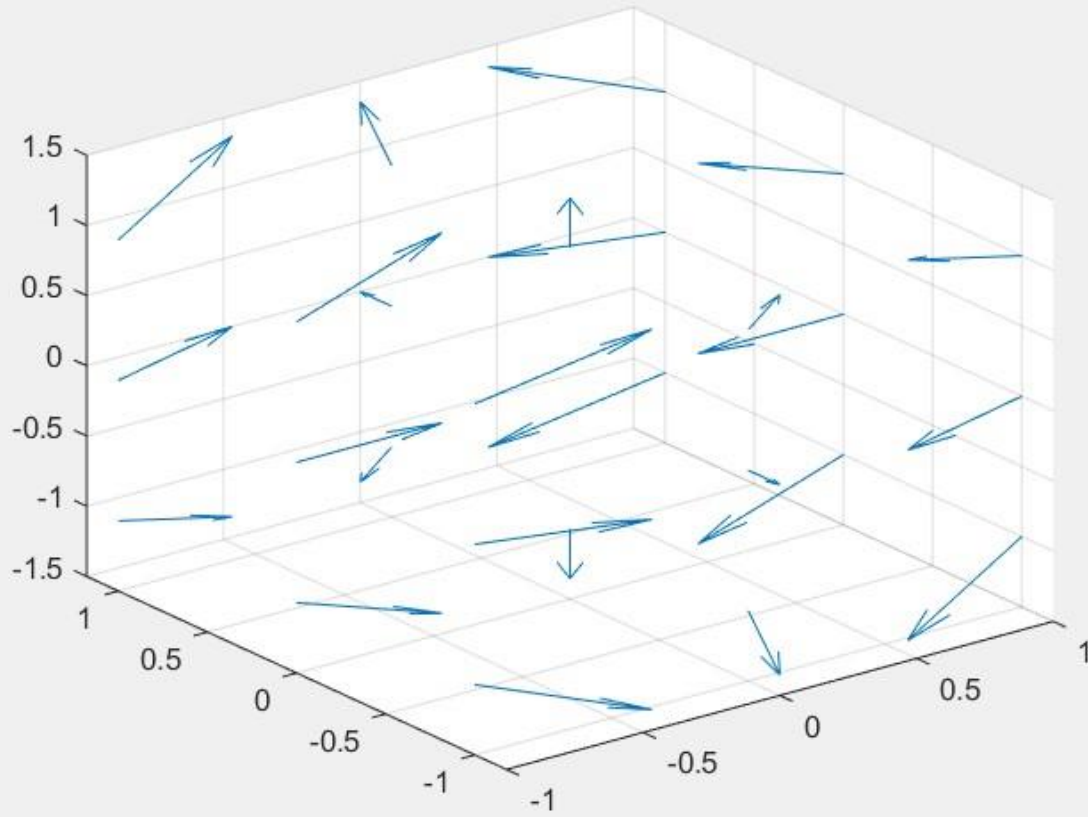
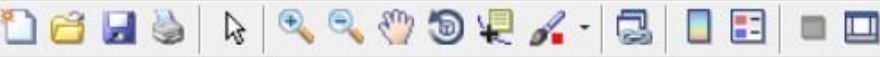
Command Window

```
-3*x
      y
      2*z
```

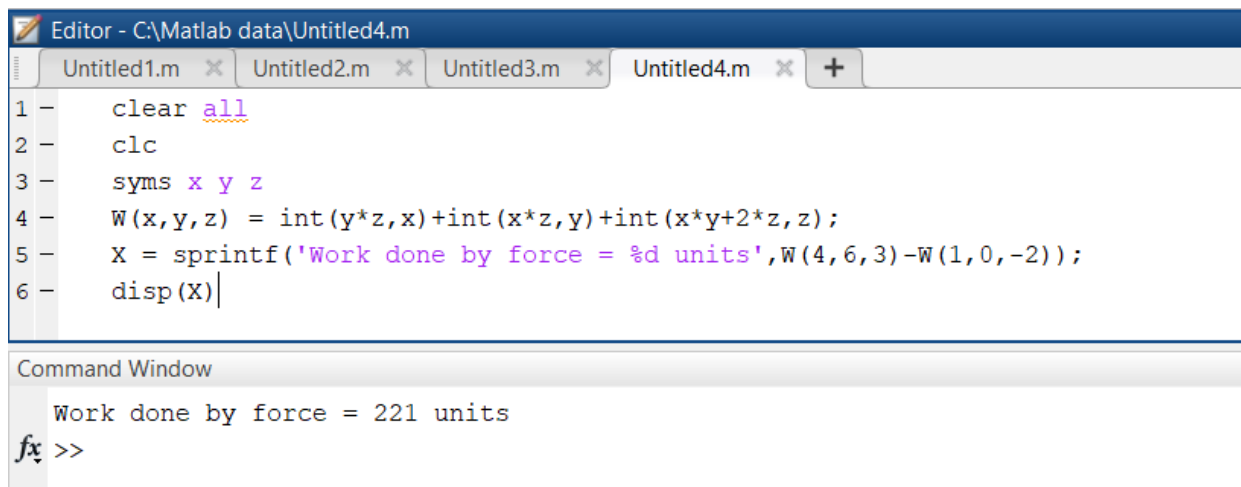
*fx* >>

Figure 1

File Edit View Insert Tools Desktop Window Help



Find the work done for the force  $\vec{F}(x,y,z) = yz\vec{i} + xz\vec{j} + (xy+2z)\vec{k}$  along the line segment from (1,0,-2) to (4,6,3).



The image shows a MATLAB Editor window with the following code in Untitled4.m:

```

1 - clear all
2 - clc
3 - syms x y z
4 - W(x,y,z) = int(y*z,x)+int(x*z,y)+int(x*y+2*z,z);
5 - X = sprintf('Work done by force = %d units',W(4,6,3)-W(1,0,-2));
6 - disp(X)

```

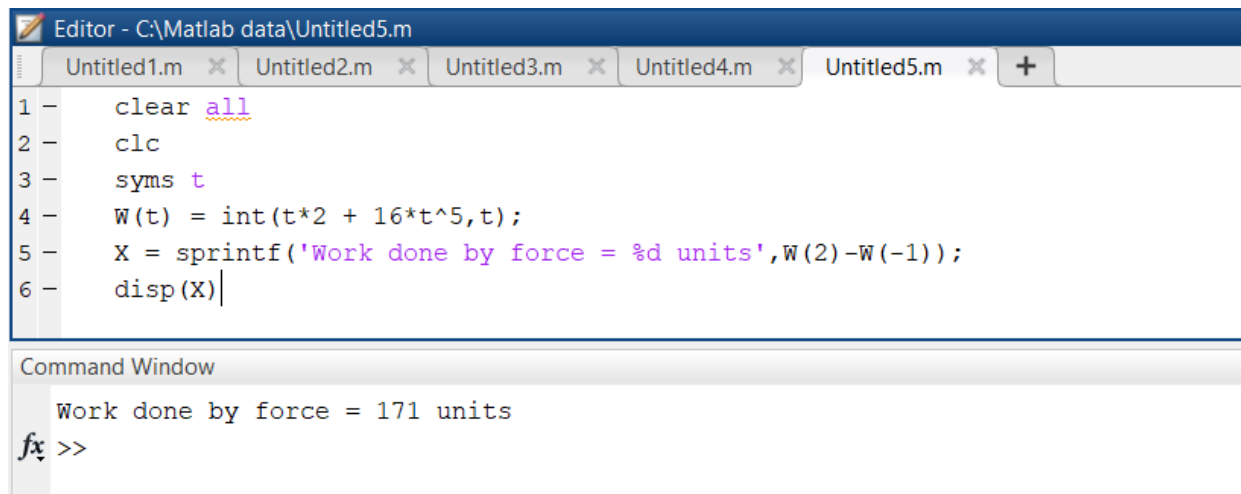
The Command Window shows the output:

```

Work done by force = 221 units
fx >>

```

Find the work done for the force  $\vec{F}(x,y) = x^2\vec{i} + y^2\vec{j}$  along the arc of the parabola  $y = 2x^2$  from (-1,2) to (2,8).



The image shows a MATLAB Editor window with the following code in Untitled5.m:

```

1 - clear all
2 - clc
3 - syms t
4 - W(t) = int(t*2 + 16*t^5,t);
5 - X = sprintf('Work done by force = %d units',W(2)-W(-1));
6 - disp(X)

```

The Command Window shows the output:

```

Work done by force = 171 units
fx >>

```