FS 2019-20

MAT 1011(CFE)-ELA

ASSESSMENT- 5 : CONCEPTS OF VECTOR CALCULUS

Name :- Akshat

Srivastav

Reg. No. :- 19BCE0811

EXERCISE : 1(a)

Matlab Code :

```
syms x y z
f=input('Enter the function f(x,y,z)=')
f1=diff(f,x)
f2=diff(f,y)
f3=diff(f,z)
gradf=[f1 f2 f3]
```

INPUT –

```
Enter the function f(x,y,z)=
(x^2+y^2)^2.5
f =
(x^2 + y^2)^(5/2)
```

OUTPUT –

```
f1 =
5*x*(x^2 + y^2)^(3/2)
f2 =
5*y*(x^2 + y^2)^(3/2)
f3 =
0
gradf =
[ 5*x*(x^2 + y^2)^(3/2), 5*y*(x^2 + y^2)^(3/2), 0]
```

EXERCISE : 1(b)

Matlab Code :

```
syms x y z
f=input('Enter the function f(x,y,z)=')
f1=diff(f,x)
f2=diff(f,y)
f3=diff(f,z)
gradf=[f1 f2 f3]
```

INPUT –

```
Enter the function f(x,y,z)=
2*x+y*z-3*y^2
f =
- 3*y^2 + z*y + 2*x
```

OUTPUT –

```
f1 =
2
f2 =
z - 6*y
f3 =
y
gradf =
[ 2, z - 6*y, y]
```

EXERCISE : 1(c)

Matlab Code :

```
syms x y z
f=input('Enter the function f(x,y,z)=')
f1=diff(f,x)
f2=diff(f,y)
f3=diff(f,z)
x0=input('Enter the value of x0=')
y0=input('Enter the value of y0=')
z0=input('Enter the value of z0=')
F1=subs(f1 , [x,y,z] , [x0,y0,z0])
F2=subs(f2 , [x,y,z] , [x0,y0,z0])
F3=subs(f3 , [x,y,z] , [x0,y0,z0])
gradf=[F1 F2 F3]
```

INPUT –

```
Enter the function f(x,y,z)=
exp(x*y)*cos(z)+(y+1)*asin(x)
f =
asin(x)*(y + 1) + exp(x*y)*cos(z)
```

OUTPUT –

```
f1 =
(y + 1)/(1 - x^2)^(1/2) + y*exp(x*y)*cos(z)
f2 =
asin(x) + x*exp(x*y)*cos(z)
f3 =
-exp(x*y)*sin(z)
Enter the value of x0=
0
x0 =
0

Enter the value of y0=
0
y0 =
0

Enter the value of z0=
pi/6
z0 =
0.5236

F1 =
1
F2 =
0
F3 =
-1/2
gradf =
[ 1, 0, -1/2]
```

EXERCISE : 2(a)

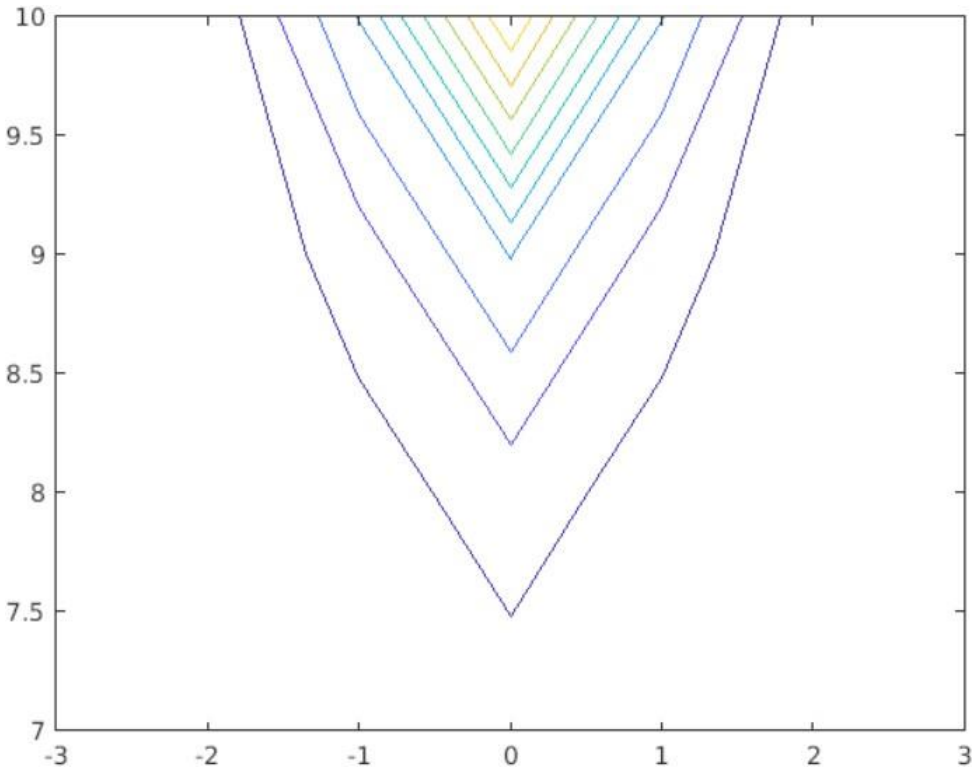
Matlab Code :

```
syms x y
[x,y] = meshgrid(-3:1:3 , 7:1:10)
z = input('Enter the function f(x,y)=')
contour(x,y,z)
```

INPUT –

```
Enter the function f(x,y)=
exp(y-x.^2)
```

OUTPUT –



EXERCISE : 2(b)

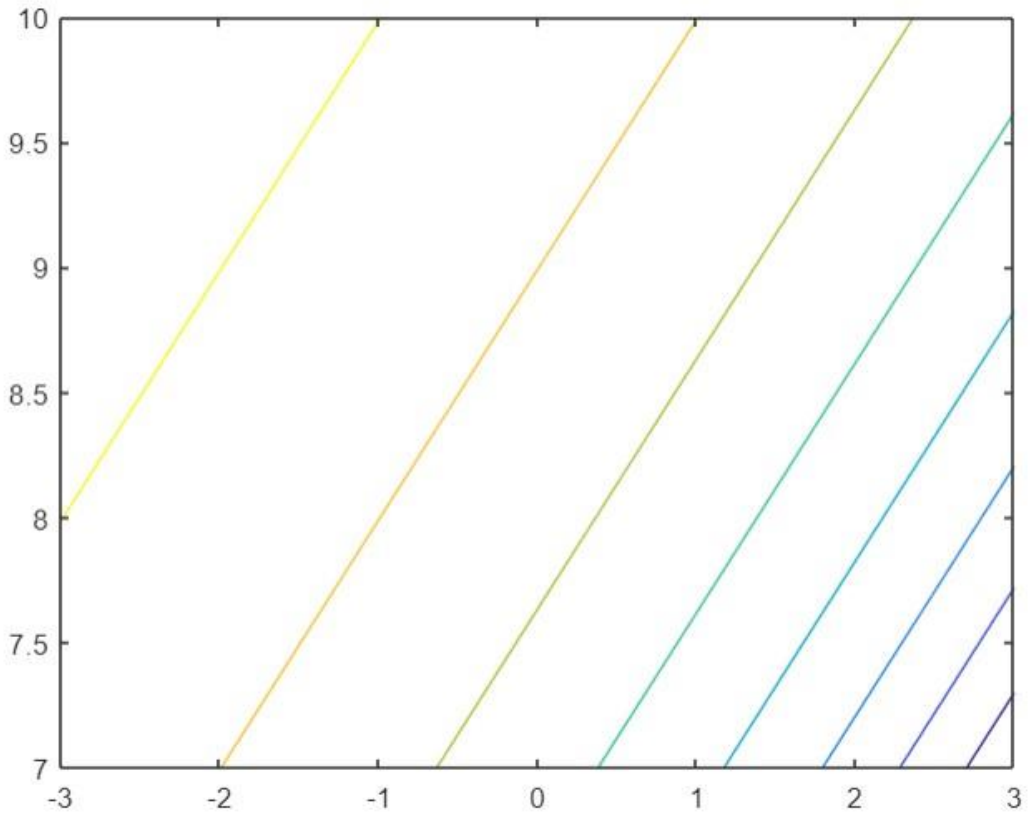
Matlab Code :

```
syms x y
[x,y] = meshgrid(-3:1:3 , 7:1:10)
z = input('Enter the function f(x,y)=')
contour(x,y,z)
```

INPUT –

```
Enter the function f(x,y)=
atan(y-x)
```

OUTPUT –



EXERCISE : 3

Matlab Code :

```
syms x y z
f1=input('Enter i component of f vector = ')
f2=input('Enter j component of f vector =')
f3=input('Enter k component of f vector =')
F1=(diff(f3,y))-(diff(f2,z))
F2=(diff(f1,z))-(diff(f3,x))
F3=(diff(f2,x))-(diff(f1,y))
curlf=F1+F2+F3
if curlf==0
    disp(['The given function is conservative'])
else
    disp(['The given function is not conservative'])
end
```

INPUT –

```
Enter i component of f vector =
y*z*cos(x)
f1 =
y*z*cos(x)
Enter j component of f vector =
z*sin(x)+1
f2 =
z*sin(x) + 1
Enter k component of f vector =
y*sin(x)
f3 =
y*sin(x)
```

OUTPUT –

```
F1 =
0
F2 =
0
F3 =
0
curlf =
0
The given function is conservative
```

EXERCISE : 4

Matlab Code :

```
syms x y z
f=input('Enter the function f(x,y,z)=')
df1=diff(f,x)
df2=diff(f,y)
df3=diff(f,z)
ddf1=diff(df1,x)
ddf2=diff(df2,y)
ddf3=diff(df3,z)
d=ddf1+ddf2+ddf3
if d==0
    disp(['f is a harmonic function.'])
else
    disp(['f is not harmonic function. '])
end
```

INPUT –

```
Enter the function f(x,y,z)=
4*z^3-6*(x^2+y^2)*z
f =
4*z^3 + (- 6*x^2 - 6*y^2)*z
```

OUTPUT –

```
df1 =
-12*x*z
df2 =
-12*y*z
df3 =
- 6*x^2 - 6*y^2 + 12*z^2
ddf1 =
-12*z
ddf2 =
-12*z
ddf3 =
24*z
d =
0
f is a harmonic function.
```