

Program-11:

1. Write a program for a gradient of a scalar function of $x^2*y*z+4*x*z^2$ at (1,-2,-1).

```
clc;  
clear;  
function y=f(x)  
    y=x(1)^2*x(2)*x(3)+4*x(1)*x(3)^2  
endfunction  
x=[1,-2,-1]  
j=numderivative(f,x)  
disp(j)
```

Output:

8. -1. -10.

2. Write a program to find a gradient of a scalar function of $4xz^3 - 3x^2y^2z$ at $(2, -1, 2)$.

```
clc;
clear;
function y=f(x)
    y=4*x(1)*x(3)^3-3*x(1)^2*x(2)^2*x(3)
endfunction
x=[2,-1,2]
j=numderivative(f,x)
disp(j)
```

Output:

8. 48. 84.

Program-12:

1. Write a program to find a divergence and curl of a scalar function of $(x^3z^3)i - (2x^2yz)j + (2y^3z^3)k$ at $(1, -1, 1)$.

```
clc;
clear;
function f=G(p)
    f(1)=p(1)*p(3)^3
    f(2)=-2*p(1)^2*p(2)*p(3)
    f(3)=2*p(2)*p(3)^3
endfunction
p=[1,-1,1];
j=numderivative(G,p)
disp('j',j);
div=j(1,1)+j(2,2)+j(3,3)
disp('Divergence',div);
c(1)=j(3,2)-j(2,3);
c(2)=j(1,3)-j(3,1);
c(3)=j(2,1)-j(1,2);
disp('Curl',c)
```

Output:

"j"

1. 0. 3.

4. -2. 2.

0. 2. -6.

"Divergence"

-7.0000000

"Curl"

0.

3.0000000

4.0000000

2. Write a program to find a divergence and curl of a scalar function of $(3x^2 - 3yz)i - (3y^2 - 3xz)j + (3z^2 - 3xy)k$ at $(1,1,1)$.

```
clc;
clear;
function f=G(p)
    f(1)=3*p(1)^2-3*p(2)*p(3)
    f(2)=3*p(2)^2-3*p(1)*p(3)
    f(3)=3*p(3)^2-3*p(1)*p(2)
endfunction
p=[1,1,1];
j=numderivative(G,p)
disp("j",j);
div=j(1,1)+j(2,2)+j(3,3)
disp("Divergence",div);
c(1)=j(3,2)-j(2,3);
c(2)=j(1,3)-j(3,1);
c(3)=j(2,1)-j(1,2);
disp("Curl",c)
```

Output:

"j"

6. -3. -3.

-3. 6. -3.

-3. -3. 6.

"Divergence"

18.000000

"Curl"

0.

0.

0.

Program-13:

1. Write a program to find the solution of a second order differential equation of a function $2y'' - 5y' + y = 0$, $y(3) = 6$ and $y(3) = -1$ find at $x = 4$

```
clc;
clear;
function dx=f(t, x);
    dx(1)=x(2)
    dx(2)=-x(1)/2+5/2*x(2)
endfunction
sol=ode([6,-1],3,4,f);
disp(sol)
```

Output:

```
-2.1197272
-23.118634
```