Date of Assignment: 10.03.2025
Date of Submission: 24.03.2025

Assignment 8

Question

Find the directional derivative of $f = x^2 y^2 z^2$ at $(1,1,1)$ along $2\hat{i} - \hat{j} + 4\hat{k}$.

Code

```
syms x y z;
f = x^2 * y^2 * z^2;
disp('Function f = ');
disp(f);
grad = gradient(f,[x,y,z]);
disp ('gradient of f at (x,y,z)')
disp(grad);
b = subs(grad, [x,y,z], [1,1,1]);
c = double(b);
disp ('gradient of f at (1,1,1)')
disp(c);
a = [2,-1,4];
magnitude = norm(a);
unit_vec = a/magnitude;
direc_deriv = dot(b,unit_vec);
disp('Directional Derivative of f at (1,1,1) along 2i^ - j^ + 4k^ = ')
disp(direc_deriv);
```

Output

```
>> Assignment_8
Function f =
x^2*y^2*z^2

gradient of f at (x,y,z)
2*x*y^2*z^2
2*x^2*y*z^2
2*x^2*y^2*z

gradient of f at (1,1,1)
     2
     2
     2
```

```
Directional Derivative of f at (1,1,1) along 2i^ - j^ + 4k^ =
(10*21^(1/2))/21

>>
```