21BDS0340

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# Digital Lab Assignment 5

## Problem 1

Find the work done for the force *F = yzi + xzj + (xy + 2z)k* along the line segment from (1,0,-2) to (4,6,3).

### Code:

syms x y z t

f = [y\*z, x\*z, x\*y + 2\*z];

P1 = [1, 0, -2]; P2 = [4, 6, 3];

P(x, y, z) = f(1); Q(x, y, z) = f(2); R(x, y, z) = f(3);

r = (P2 - P1) \* t + P1; % parameterisation

lim = [0, 1];

F = subs(f, {x, y, z}, r);

dr = diff(r, t);

F1 = sum(F.\*dr);

W = int(F1, t, lim(1), lim(2))

% graphing for visualisation

xlin = linspace(P1(1), P2(1), 11); ylin = linspace(P1(2), P2(2), 11); zlin = linspace(P1(3), P2(3), 11);

[X, Y, Z] = meshgrid(xlin, ylin, zlin);

quiver3(X, Y, Z, P(X, Y, Z), Q(X, Y, Z), R(X, Y, Z))

hold on

a = linspace(0, 1, 11);

plot3(subs(r(1), a), subs(r(2), a), subs(r(3), a))

xlabel('x'); ylabel('y'); zlabel('z');

### Output:

Text

Description automatically generated with medium confidence

Chart

Description automatically generated

## Problem 2

Verify Green’s theorem for the vector field *F = (x2 – y3)i + (x3 + y2)j* , over the ellipse *C: x2 + 4y2 = 64.*

### Code:

syms x y t

f = [x^2 - y^3, x^3 + y^2];

M(x, y) = f(1); N(x, y) = f(2);

r = [8\*cos(t), 4\*sin(t)];

dr = diff(r, t);

F = subs(f, {x, y}, r);

F1 = sum(F.\*dr);

T = [0, 2\*pi];

LHS = int(F1, t, T(1), T(2));

ylim = [-sqrt(16 - (x/2)^2), sqrt(16 - (x/2)^2)];

xlim = [-8, 8];

F2 = diff(N, x) - diff(M, y);

RHS = int(int(F2, y, ylim(1), ylim(2)), x, xlim(1), xlim(2));

if LHS == RHS

disp('LHS = ')

disp(LHS)

disp('RHS = ')

disp(RHS)

disp('Therefore Greens theorem is verified')

end

Output:

Text

Description automatically generated with low confidence