

# Multivariable Calculus: Tutorial 14

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# Progress Update

Over the past week I have learned about:

- 1 Line integrals in space.
- 2 Curl of 3-forces.
- 3 Stoke's theorem.

# Line integrals in space.

The line integral in space has the same form as that for in the plane:

$$\text{Work} = \int_C \mathbf{F} \cdot d\mathbf{r} \quad (1)$$

Curl of a force  $F = \langle P, Q, R \rangle$  is defined as

$$\text{Curl}(F) = \langle (R_y - Q_z), (P_z - R_x), (Q_x - P_y) \rangle \quad (2)$$

# Stoke's Theorem.

Stoke's theorem is for line integrals in space as Green's theorem is to line integrals in the plane; for a closed surface  $C$  and a surface  $S$  bounded by  $C$ ,

$$\text{Work} = \oint_C F \cdot dr = \iint_S \text{Curl}(F) \cdot \hat{n} dS \quad (3)$$