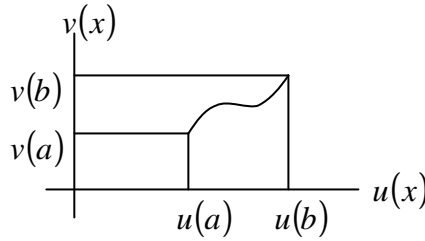


1. Partial integration

$$\int u dv = uv - \int v du$$



2. Gauss theorem

$$\iint_S \vec{F} \cdot \vec{n} dS = \iiint_V \nabla \cdot \vec{F} dV$$

3. Stokes' theorem

$$\oint_C \vec{F} \cdot d\vec{r} = \iint_S (\nabla \times \vec{F}) \cdot \vec{n} dS$$

4. Green's function

在 s 處施加一外力項，而在 x 處所得之反應 $G(x, s)$

5. Green's theorem

$$\oint_C f(x, y) dx + g(x, y) dy = \iint_D \left(\frac{\partial g}{\partial x} - \frac{\partial f}{\partial y} \right) dx dy$$

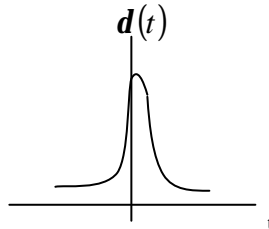
6. Divergence and curl

$$\text{div}(\vec{F}) = \nabla \cdot \vec{F} = \frac{\partial F_1}{\partial x_1} + \frac{\partial F_2}{\partial x_2} + \frac{\partial F_3}{\partial x_3}$$

$$\text{curl}(\vec{F}) = \nabla \times \vec{F} = \begin{vmatrix} i & j & k \\ \frac{\partial}{\partial x_1} & \frac{\partial}{\partial x_2} & \frac{\partial}{\partial x_3} \\ F_1 & F_2 & F_3 \end{vmatrix}$$

7. Dirac-Delta function

$$\int_{-\infty}^{\infty} \mathbf{d}(t) dt = 1, \mathbf{d}(t) = \begin{cases} \infty, & t = 0 \\ 0, & t \neq 0 \end{cases}$$



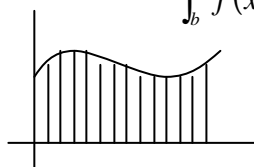
8. Directional derivative

$$\frac{\partial u}{\partial n} = \nabla u \cdot \vec{n}$$

9. Riemann sum

$$\sum_{i=1}^n f(c_i) \Delta x_i, x_{i-1} \leq c_i \leq x_i$$

$$\int_b^a f(x) dx = \sum_{i=1}^{\infty} f(c_i) \Delta x_i$$



10. Cauchy principal value

$$\int_{-1}^1 \frac{1}{x} dx = \lim_{\epsilon \rightarrow 0} \int_{-1}^{-\epsilon} \frac{1}{x} dx + \int_{\epsilon}^1 \frac{1}{x} dx$$