$\iint_S A\cdot\hat{n}\, ds$ If it is exact is called normal surface integral

$d\vec{S} = \hat{n}\, ds$ — ds is magnitude $\hat{n}$ is direction

$\iint A\cdot\hat{n}\, ds = \int \vec{A}\cdot d\vec{s}$ is called flux of A through S

or

$\iint_S \phi\, ds$, $\iint_S A\times ds$

Th

$\Rightarrow$ $\iint_S A\cdot\hat{n}\, ds = \iint_R A\cdot\hat{n}\, \frac{dx\,dy}{|\hat{n}\cdot\hat{k}|}$

Let R be the Projection of the surface S on xy-plane

green theorem

$$\oint_C M\,dx + N\,dy = \iint_R \left(\frac{\partial N}{\partial x} - \frac{\partial M}{\partial y}\right) dx\,dy$$

The

$\Rightarrow$ The necessary and sufficient condition for a vector $\vec{A}$ to have a constant direction

$A \times \frac{d\vec{A}}{dt} = 0$

$\Rightarrow$ The " " A to have " " constant magnitude is $A\cdot\frac{dA}{dt} = 0$