```
.nr HM 0.3i
.nr FM 0.3i
.TL
.B "Mathematical analysis"
.EQ
gsize 11
define prt 'partial'
delim $$
.EN
.SH
Scalar field
.PP
If each point of the field is a scalar value U or $ U~=~U(x,y,z)$ that the field is the scalar field.
.SH
Gradient
.PP
Gradient of scalar field:
.PP
$ gradU~=~ {partial U} over {partial x} cdot i vec~+~{partial U} over {partial y} cdot j vec~+~{partial U}
over {partial z} cdot k vec$
.SH
Divergence
.PP
Divergence of vector field is:
.PP
$ div~a~=~{prt a sub x (x,y,z)} over {prt x}~+~ {prt a sub y (x,y,z)} over {prt y}~+~{prt a sub z (x,y,z)}
over {prt z}$
.SH
Rotor
.PP
Rotor of vector field:
.PP
$rot~a~=~left | matrix{
lcol { i vec above prt over {partial x} above a sub x}
ccol { j vec above prt over {partial y} above a sub y}
lcol { k vec above prt over {partial z} above a sub z}
} right |$
.SH
Theorem of Gauss
.PP
Gauss's theorem (Ostrogradsky's theorem, divergence theorem) states that the outward flux of the vector field
through a closed surface is equal to the volume integral of the divergence over the region inside the surface.
.sp
$int^int from size -2 S { a sub n ds}~=~ int^int from size -2 T^int { div^a^dx dy dz}$
.SH
Solenoidal vector field
.PP
If each point of the vector filed a vec corresponds to the condition $div~a vec~=~0$, it means this fiekd is
solenoidal.
.SH
Potential vector field
.PP
If each point of the vector field a vec correspnods to the condition $rot~a vec~=~0$, it means this field is
potential.
.SH
Rotational vector field
.PP
If $rot~a vec != 0$ than the vector field a vec is rotational.
.TS
tab(@), doublebox;
cw(1i) sw(1i) sw(2i)
c | l || l
^ | l || l
^ | l || l
c | s || l.
Properties@@
=
Vector field@Solenoidal@T{
$ div a vec~=~0$ ,
$ grad vec~cdot~( grad vec times a vec )~=~0$
T}
_
@Potential@T{
$rot a vec~=~0$
T}
_
@Rotational@T{
$rot~a vec~=~grad vec~ times a vec~ != ~0$
T}
=
Scalar Field@T{
$U~=~U(x,y,z)$
T}
.TE
```