

# CHAPTER 1 REVIEW

## 1.1 VECTOR ALGEBRA

- GEOMETRICAL DEFINITIONS OF  $\vec{A} \cdot \vec{B}$ ,  $\vec{A} \times \vec{B}$ ,  $a\vec{A}$
- PROPERTIES OF VECTOR OPERATIONS, E.G.  $\vec{A} \times \vec{B} = -\vec{B} \times \vec{A}$ ,  $\vec{A} \cdot \vec{B} = \vec{B} \cdot \vec{A}$
- COMPONENT FORM
- TRIPLE PRODUCTS
- $\vec{A} = \vec{r} - \vec{r}'$

## 1.2 DIFFERENTIAL CALCULUS

- $\nabla T$ ,  $\nabla \cdot \vec{v}$ ,  $\nabla \times \vec{v}$
- PRODUCT RULES
- SECOND DERIVATIVES, INCL.  $\nabla^2 T$

## 1.3 INTEGRAL CALCULUS

- LINE, SURFACE, VOLUME INTEGRALS
- GRADIENT THEOREM, DIVERGENCE THEOREM, CURL THEOREM

## 1.4 CURVILINEAR COORDINATES

- CYLINDRICAL  $s, \phi, z$
- SPHERICAL POLAR  $r, \theta, \phi$

## 1.5 DIRAC DELTA FUNCTION

- 1D  $\delta(x)$
- 3D  $\delta^3(\vec{r})$

## 1.6 THEORY OF VECTOR FIELDS

- HELMHOLTZ THEOREM,  $\vec{v} = \nabla U + \nabla \times \vec{A}$
- IRROTATIONAL FIELDS,  $\nabla \times \vec{v} = 0$ ,  $\vec{v} = \nabla U$
- SOLENOIDAL FIELDS,  $\nabla \cdot \vec{v} = 0$ ,  $\vec{v} = \nabla \times \vec{A}$