

Symbol Definitions and First Usage

Since this work contains a large number of concepts symbolically expressed, I felt it might be useful if a brief definition of these symbols existed in some place for purposes of reference. In general, the use of bold face type denotes a vector quantity; while an Old English Text type font used for tensor-like quantities of rank 2 or higher. The exception is an outlined font used for the unit tensor. Subscripted Old English type is used to represent the components of these tensors. Various other type faces have been employed to provide symbolic representation of scalar quantities which appear throughout this work. What follows is a list of the meaning of these symbols and where they first appear.

Scalars and Special Parameters

<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>	<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>
A	An arbitrary scalar	2.4.10	\mathcal{L}	The magnitude of the angular momentum vector	3.3.19
A	Constant in the degenerate equation of state	N4.2.3	\mathcal{M}	Total internal magnetic energy	2.5.18
B	Constant in the degenerate equation of state	N4.2.3	M_{\odot}	The mass of the sun	3.5.22
D	The magnitude of the electric displacement vector	N2.4.1	N	The particle number density	2.5.21
E	Total energy of a system	1.1.8	P	Total scalar pressure	1.1.6
F	The magnitude of the radiative flux	1.1.10	P_g	Total gas pressure	N3.2.7
G	Gravitational constant	1.1.7	P_1	A relativistic correction term	4.1.18
G	A temporary quantity	1.2.2	Q	Arbitrary macroscopic system parameter	1.5.1
H	The magnitude of the magnetic field intensity	N2.4.1	$\langle Q \rangle$	Average Q	1.5.1
I	Moment of inertia about a coordinate origin	1.2.3	Q	Arbitrary point-defined system property	2.2.3
I_r	Moment of inertia including relativistic terms	2.3.15	Q_p	Surface pressure term	3.4.12
I_z	Moment of inertia about the Z-axis	3.2,21		Defined in	3.4.8
J	Trace of the Maxwell tensor	2.4.3	Q_m	Magnetic surface term	3.4.11
K	The constant of proportionality in the polytropic equation of state	N4.2.1	Q_i	The generalized forces	3.5.1
L(r)	Stellar luminosity	1.1.10	R	The Rydberg constant	3.3.2
L_{\odot}	Solar luminosity	4.4.3	R	Stellar or configuration radius	3.2.20
			R_S	The Schwarzschild	4.1.27
			R_{\odot}	The solar radius	3.5.22
			\mathfrak{R}	The total rotational kinetic energy	2.5.17

<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>	<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>
S	The 'creation rate' or collision term in the Boltzmann transport equation	1.1.1	h	Planck's constant	4.1.32
\bar{S}	The velocity-averaged 'creation rate'	1.1.2	\mathcal{H}	dimensionless magnetic field intensity	4.2.10
S	The surface enclosing a volume V	2.5.12	k	Boltzmann's constant	2.5.21
T	The total kinetic energy of the system	1.2.5	m_i	mass of the <i>i</i> th particle	1.2.1
\bar{T}	The time-averaged kinetic energy of the system	1.2.15	m_e	mass of the electron	4.1.32
$\langle T \rangle$	The phase-averaged kinetic energy of the system	3.5.8	m_p	mass of the proton	4.1.33
T_0	A period of time	1.2.14	$m(r)$	mass interior to a sphere of radius <i>r</i>	1.1.10
T	Kelvin-Helmholtz contraction time	4.4.3	$m(V)$	mass interior to a sphere of volume V	N3.5.2
<i>T</i>	Pulsation period	3.2.24	n	force-law exponent	1.2.8
\mathcal{T}	The kinetic or gas temperature	2.5.20	n	polytropic index	4.1.25
\mathcal{T}_1	The kinetic energy of radial motion	3.3.6	q	A dimensionless mass	4.1.16
\mathcal{T}_2	Thermal kinetic energy	3.3.2	q_i	<i>i</i> th linearly independent coordinate	3.5.1
\mathcal{T}_3	Rotational kinetic energy	3.3.6	r	radial coordinate	1.1.10
\mathcal{U}	Total potential energy	1.1.12	r_i	radial coordinate of the <i>i</i> th particle	1.2.2
\mathcal{U}	The total internal heat energy	2.5.20	r_{ij}	separation between the <i>i</i> th and <i>j</i> th particles	1.2.8
$\bar{\mathcal{U}}$	The time-averaged potential energy of the system	1.2.15	s	The proper length	2.3.3
\mathcal{U}_1	The post-Newtonian correction $\times c^2$ to the Newtonian internal energy	4.1.20	t	time	1.1.1
V	Volume enclosing the system	1.4.1	t_0	an initial time	1.5.1
W	A relativistic super-potential	2.4.13	u	stream speed	2.4.6
Y	A relativistic super-potential	2.4.13	u	thermal energy density	4.1.20
Z	A relativistic super-potential	2.4.13	v	magnitude of a velocity vector	1.1.3
a_{ij}	force-law proportionality constant	1.2.8	w	Fractional angular velocity	4.2.8
c	The speed of light	2.3.3	x_α	components of Minkowski space	2.3.3
c_p	Specific heat of constant pressure	2.5.21	x	Parametric variable in the degenerate equation of state	4.1.30
c_v	Specific heat of constant volume	2.5.21	x	a dimensionless length	4.1.16
			x	a Cartesian coordinate	3.3.18
			y	a Cartesian coordinate	3.3.18
			\mathcal{Y}	normalized relativistic density	4.1.1
			Γ_1	1 st adiabatic constant	4.1.31
			Π/c^2	internal energy of a relativistic gas	2.4.7
			Φ	An arbitrary potential	1.2.8
			$\langle \Phi \rangle$	A relativistic super-potential	2.4.13

<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>	<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>
χ	Local energy of non-conservative forces	1.1.8	ζ_1	A dimensionless measure of polytropic structure	4.1.26
\mathfrak{S}	A high order super-potential	2.2.10	ζ_2	A dimensionless measure of polytropic structure	4.1.26
\mathfrak{R}	A high order super-potential	2.2.10	η	A dimensionless scale factor	4.1.17
Ψ	The Newtonian potential	1.1.4	η	A proportionality constant	4.3.2
\aleph	Ratio of average to surface pressure	4.4.1	θ	Polar angle in Spherical Coordinates	3.3.18
Ω	Newtonian Gravitational potential energy	1.2.13	θ	The Polytropic Temperature	4.3.6
$\bar{\Omega}$	Time-averaged Gravitational potential energy	1.2.16	ξ	The Polytropic radial coordinate in Emden Variables	4.3.6
$\langle\Omega\rangle$	Phase-averaged Gravitational potential energy	3.5.8	ξ_1	The Polytropic Emden Radius	4.3.6
Ω_1/c^2	Post-Newtonian correction to the Gravitational potential energy	4.1.14	ρ	The local matter density	1.1.2
α	parameter measuring central mass concentration	4.2.8	ρ_e	The electric charge density	2.5.4
β	The angle between the local H-field and \mathbf{r}	3.4.14	ρ_e	The electric mass density	4.1.32
β_i	proportionality constant for velocity-dependant forces	1.3.3	ρ^*	Modified matter-energy density	2.4.6
γ	$(1 - v^2 / c^2)^{1/2}$	2.3.3	σ	Modified matter-energy density	2.4.6
γ	$(1 - v^2 / c^2)^{-1/2}$	4.3.1	σ	Pulsational frequency	3.2.12
γ	ratio of specific heats	2.5.23	τ	Relativistic kinetic energy density	N2.3.5
ε	Energy generation rate from non-viscous sources	1.1.9	φ	The source for a relativistic super potential	2.4.9
ε	The total energy density	2.6.3	ϕ	Azimuthal polar coordinate	3.4.5
ε	The potential energy density	N2.3.6	ψ	Phase-space point density	1.1.1
ε	A perturbation parameter	4.1.28	ω	Magnitude of the angular velocity	N2.6.4, 3.3.18
\mathcal{E}	Thermal kinetic energy density	2.5.21			

Vectors and Vector Components

<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>	<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>
A	An arbitrary vector	N2.4.9	p_i	Momentum vector of the <i>i</i> th particle	1.2.1
B	The magnetic field vector	2.5.3	p_i	Components of the momentum vector of a particle	1.1.1
B_i	The components of B	2.5.2	p	The local momentum density	1.4.3
D	The electric displacement vector	2.5.3	r_i	Radius vector to the <i>i</i> th particle	1.2.1
D_i	The components of D	2.5.2	r_i	Components of radius vector	2.5.23
E	The electric field vector	2.5.3	r̂	Unit vector in the r -direction	page 2
E_i	The components of E	2.5.2	u	The local stream-velocity	1.1.2
F	The radiative flux	1.1.8	u_i	Components of the stream velocity	2.1.4
F_i	Total force on the <i>i</i> th particle	page 2	u_α	Components of the 4-velocity	2.3.3
F_{ij}	Force between the <i>i</i> th & <i>j</i> th particles	1.2.7	u	The Lagrangian displacement velocity vector	N3.6.1
G	An arbitrary vector	N2.4.9	v	The local velocity vector	1.1.1
H	The magnetic field intensity	2.5.3	v_i	Velocity vector of the <i>i</i> th particle	1.2.1
H_i	Cartesian components of H	2.5.2	w	The local peculiar velocity in a rotating coordinate frame	2.5.6
Ĥ₀	A unit vector along H	3.4.14	w̄	Velocity-dependant force vector	1.3.1
K	The relativistic linear momentum density in the post Newtonian approximation	2.4.11	w	The angular velocity field vector	2.5.5
S	The vector “creation” rate	1.1.4	w_i	Cartesian components of the angular velocity field vector	N2.5.4
Y	A relativistic super potential	2.4.8	ω	The local residual velocity field in a rotating coordinate frame	N2.6.2
dS	The differential surface normal vector	2.3.2	ω_i	Cartesian components of the local residual velocity field	2.5.15
f	The local force vector	1.1.1	x	A Cartesian coordinate vector	2.6.3
f_i	Force acting on the <i>i</i> th particle	1.2.1	x_i	Components of the Cartesian coordinate vector	1.1.1
f	Local force density	1.4.3	z_i	A velocity independent force vector on the <i>i</i> th particle	1.3.1
f_f	The frictional force density	2.5.24			
l	The net local angular momentum density	2.5.16			
n	The Lagrangian displacement vector	3.3.38			
η_i	The Cartesian components of the Lagrangian displacement vector	N3.5.1			

Tensors and Tensor Components

<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>	<u>Symbol</u>	<u>Meaning</u>	<u>First Used</u>
\mathbf{f}	The frictional tensor acting as the source for frictional forces	2.5.24	\mathfrak{R}_{ij}	Components of the Ricci tensor	2.4.3
\mathfrak{I}	The moment of inertia tensor	2.1.5	\mathfrak{S}	The surface energy tensor	2.5.12
\mathfrak{I}_{ij}	Components of the moment of inertia tensor	2.1.11	\mathfrak{S}_{ij}	Components of \mathfrak{S}	2.5.12
\mathfrak{T}	The Maxwell stress-energy tensor or energy momentum tensor	2.3.1	\mathfrak{T}	The kinetic energy tensor	2.1.5
\mathfrak{T}_{ij}	Components of \mathfrak{T}	2.3.4	\mathfrak{T}_{ij}	Components of \mathfrak{T}	2.1.11
\mathfrak{L}	The volume angular momentum tensor	2.5.10, N 2.6.3	\mathfrak{U}	The potential energy tensor	2.1.5
\mathfrak{L}_{ijk}	Components of \mathfrak{L}	2.5.15	\mathfrak{U}_{ij}	Components of \mathfrak{U}	N2.2.1
\mathfrak{M}	The magnetic energy tensor	2.5.14	\mathfrak{I}	The unit tensor	2.2.7
\mathfrak{M}_{ij}	Components of \mathfrak{M}		δ_{ij}	Components of \mathfrak{I} , the Kronecker delta	2.4.5
\mathfrak{P}	The pressure tensor	1.1.4	ϵ_{ijk}	The components of the Levi-Civita tensor density	N2.5.4
\mathfrak{P}_g	The gas pressure tensor	2.5.1	h_{ij}	Components of the metric perturbation tensor	2.4.1
			g_{ij}	Components of the metric tensor	2.4.1

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