Formulario

F1 - Valori di alcune costanti e grandezze

simbolo	*nome*	*valore*
e	numero di Nepero	2.71828
π	pi greco	3.14159
G	costante di gravitazione universale	$6.6730 \cdot 10^{-11}\ N \cdot m^2 \cdot Kg^{-2}$
p_0	pressione atmosferica normale	$1.01325 \cdot 10^5\ Pa$(=1 atm)
V_m	volume molare	
	(gas perfetto a $T = 273.15\ K$ e $p = p_0$)	$2.24138 \cdot 10^{-2}\ m^3$
	(sostanza gassosa a $T = 298\ K$ e $p = p_0$)	$2.45 \cdot 10^{-2}\ m^3$
N_A	numero di Avogadro	$6.02210 \cdot 10^{23}\ mol^{-1}$
R	costante universale dei gas	$8.3143\ Jmol^{-1}K^{-1}$
k	costante di Boltzmann	$1.38066 \cdot 10^{-23}\ J \cdot K^{-1}$
h	costante di Planck	$6.62618 \cdot 10^{-34}\ J \cdot s$
c	velocitá della luce nel vuoto	$2.99792458 \cdot 10^8\ m \cdot s^{-1}$
ϵ_0	costante dielettrica del vuoto	$8.85419 \cdot 10^{-12}\ F \cdot m^{-1}$
μ_0	permeabilitá magnetica del vuoto	$4\pi \cdot 10^{-7}\ H \cdot m^{-1}$
e	carica dell'elettrone	$1.6021892 \cdot 10^{-19}\ C$
a_0	raggio di Bohr (dell'atomo di idrogeno)	$5.29177 \cdot 10^{-11}\ m$
μ_B	magnetone di Bohr	$9.2741 \cdot 10^{-24}\ A \cdot m^2$
m_p	massa di riposo del protone	$1.67265 \cdot 10^{-27}\ Kg$
m_n	massa di riposo del neutrone	$1.67492 \cdot 10^{-27}\ Kg$
m_e	massa di riposo dell'elettrone	$9.10953 \cdot 10^{-31}\ Kg$

F2 - Analisi vettoriale

Relazioni di moltiplicazione

$$\vec{A} \cdot (\vec{B} \times \vec{C}) = \vec{B} \cdot (\vec{C} \times \vec{A}) = \vec{C} \cdot (\vec{A} \times \vec{B})$$
$$\vec{A} \times (\vec{B} \times \vec{C}) = \vec{B}(\vec{A} \cdot \vec{C}) - \vec{C}(\vec{A} \cdot \vec{B})$$
$$\vec{A} \times (\vec{B} \times \vec{C}) - \vec{C} \times (\vec{B} \times \vec{A}) = \vec{B} \times (\vec{A} \times \vec{C})$$
$$(\vec{A}\times\vec{B})\cdot(\vec{C}\times\vec{D}) = \vec{A}\cdot\vec{B}\times(\vec{C}\times\vec{D}) = \vec{A}\cdot(\vec{B}\cdot\vec{D}\vec{C}-\vec{B}\cdot\vec{C}\vec{D}) = (\vec{A}\cdot\vec{C})(\vec{B}\cdot\vec{D})-(\vec{A}\cdot\vec{D})(\vec{B}\cdot\vec{C})$$
$$(\vec{A} \times \vec{B}) \times (\vec{C} \times \vec{D}) = (\vec{A} \times \vec{B} \cdot \vec{D})\vec{C} - (\vec{A} \times \vec{B} \cdot \vec{C})\vec{D}$$

Relazioni differenziali

Nelle formule seguenti $\vec{A}$ e $\vec{B}$ sono funzioni vettoriali; Φ e Ψ sono funzioni scalari; sia per le une che per le altre devono essere soddisfatte opportune condizioni di continuitá e di derivabilitá.

$$\vec{\nabla}(\Phi + \Psi) = \vec{\nabla}\Phi + \vec{\nabla}\Psi$$
$$\vec{\nabla} \cdot (\vec{A} + \vec{B}) = \vec{\nabla} \cdot \vec{A} + \vec{\nabla} \cdot \vec{B}$$

$\vec{\nabla} \times (\vec{A} + \vec{B}) = \vec{\nabla} \times \vec{A} + \vec{\nabla} \times \vec{B}$

$\vec{\nabla}(\Phi\Psi) = \Phi\vec{\nabla}\Psi + \Psi\vec{\nabla}\Phi$

$\vec{\nabla}(\vec{A} \cdot \vec{B}) = \vec{A} \times \vec{\nabla} \times \vec{B} + \vec{B} \times \vec{\nabla} \times \vec{A} + (\vec{B} \cdot \vec{\nabla})\vec{A} + (\vec{A} \cdot \vec{\nabla})\vec{B}$

$\vec{\nabla} \cdot (\Phi\vec{A}) = \Phi\vec{\nabla} \cdot \vec{A} + \vec{\nabla}\Phi \cdot \vec{A}$

$\vec{\nabla} \cdot (\vec{A} \times \vec{B}) = \vec{B} \cdot \vec{\nabla} \times \vec{A} - \vec{A} \cdot \vec{\nabla} \times \vec{B}$

$\vec{\nabla} \times (\Phi\vec{A}) = \vec{\nabla}\Phi \times \vec{A} + \Phi\vec{\nabla} \times \vec{A}$

$\vec{\nabla} \times (\vec{A} \times \vec{B}) = \vec{A}\vec{\nabla} \cdot \vec{B} - \vec{B}\vec{\nabla} \cdot \vec{A} + (\vec{B} \cdot \vec{\nabla})\vec{A} - (\vec{A} \cdot \vec{\nabla})\vec{B}$

$\vec{\nabla} \cdot \vec{\nabla}\Phi = \nabla^2\Phi$

$\vec{\nabla} \times \vec{\nabla}\Phi = 0$

$\vec{\nabla} \cdot \vec{\nabla} \times \vec{A} = 0$

$\vec{\nabla} \times \vec{\nabla} \times \vec{A} = \vec{\nabla}\vec{\nabla} \cdot \vec{A} - \nabla^2\vec{A}$

$\vec{\nabla} f(\Phi) = f'(\Phi)\vec{\nabla}\Phi$

$\nabla^2(\Phi\Psi) = \Phi\nabla^2\Psi + 2\vec{\nabla}\Phi \cdot \vec{\nabla}\Psi + \Psi\nabla^2\Phi$

$\nabla^2(\Phi\vec{A}) = \Phi\nabla^2\vec{A} + \vec{A}\nabla^2\Phi + 2(\vec{\nabla}\Phi \cdot \vec{\nabla})\vec{A}$

$\vec{\nabla}\vec{\nabla} \cdot (\Phi\vec{A}) = (\vec{\nabla}\Phi)\vec{\nabla} \cdot \vec{A} + \Phi\vec{\nabla}\vec{\nabla} \cdot \vec{A} + \vec{\nabla}\Phi \times \vec{\nabla} \times \vec{A} + (\vec{A} \cdot \vec{\nabla})\vec{\nabla}\Phi + (\vec{\nabla}\Phi \cdot \vec{\nabla})\vec{A}$

$\vec{\nabla} \times \vec{\nabla} \times (\Phi\vec{A}) = \vec{\nabla}\Phi \times \vec{\nabla} \times \vec{A} - \vec{A}\nabla^2\Phi + (\vec{A} \cdot \vec{\nabla})\vec{\nabla}\Phi + \Phi\vec{\nabla} \times \vec{\nabla} \times \vec{A} + \vec{\nabla}\Phi\vec{\nabla} \cdot \vec{A} - (\vec{\nabla}\Phi \cdot \vec{\nabla})\vec{A}$

Relazioni integrali

$\int_V \vec{\nabla} \cdot \vec{A} dV = \oint_S \vec{A} \cdot \widehat{n} da$ *(Teorema della divergenza o di Gauss)*

$\int_S \vec{\nabla} \times \vec{A} \cdot \widehat{n} da = \oint_\gamma \vec{A} \cdot d\vec{l}$ *(Teorema di Stokes)*

$$\int_V \vec{\nabla}\Phi dV = \oint_S \Phi\widehat{n} da$$

$$\int_V \vec{\nabla} \times \vec{A} dV = \oint_S \widehat{n} \times \vec{A} da$$

$$\int_S \widehat{n} \times \vec{\nabla}\Phi da = \oint_\gamma \Phi d\vec{l}$$

F3 - Coordinate cartesiane

Un punto P é individuato, in un sistema di riferimento ortogonale, dalla terna: $P \equiv (x, y, z)$.

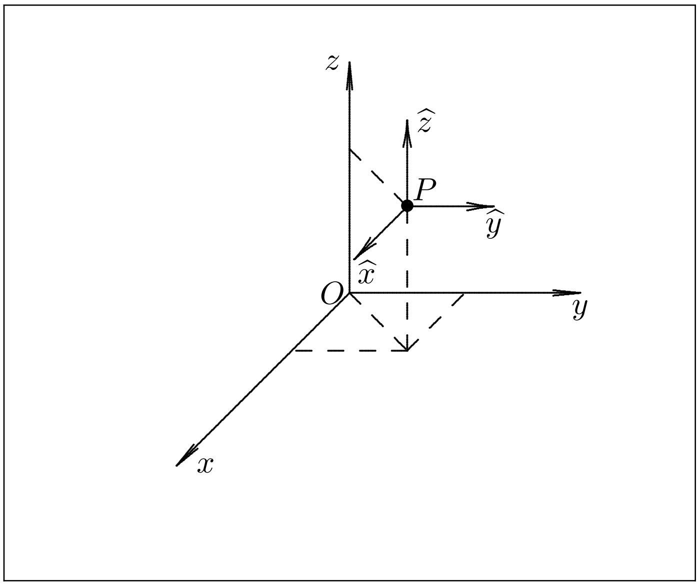

fig.F3-1

Le relazioni di moltiplicazione fra i vettori assumono la forma seguente:

$$\vec{A} \cdot \vec{B} = A_x B_x + A_y B_y + A_z B_z \qquad (F3.1)$$

$$\vec{A} \times \vec{B} = (A_y B_z - A_z B_y)\widehat{x} + (A_z B_x - A_x B_z)\widehat{y} + (A_x B_y - A_y B_x)\widehat{z} \qquad (F3.2)$$

Gli operatori differenziali si scrivono:

$$\vec{\nabla}\Phi = \frac{\partial \Phi}{\partial x}\widehat{x} + \frac{\partial \Phi}{\partial y}\widehat{y} + \frac{\partial \Phi}{\partial z}\widehat{z} \qquad (F3.3)$$

$$\nabla^2 \Phi = \frac{\partial^2 \Phi}{\partial x^2} + \frac{\partial^2 \Phi}{\partial y^2} + \frac{\partial^2 \Phi}{\partial z^2} \qquad (F3.4)$$

$$\vec{\nabla} \cdot \vec{A} = \frac{\partial A_x}{\partial x} + \frac{\partial A_y}{\partial y} + \frac{\partial A_z}{\partial z} \qquad (F3.5)$$

$$\vec{\nabla} \times \vec{A} = \left(\frac{\partial A_z}{\partial y} - \frac{\partial A_y}{\partial z}\right)\widehat{x} + \left(\frac{\partial A_x}{\partial z} - \frac{\partial A_z}{\partial x}\right)\widehat{y} + \left(\frac{\partial A_y}{\partial x} - \frac{\partial A_x}{\partial y}\right)\widehat{z} \qquad (F3.6)$$

$$\nabla^2 \vec{A} = (\nabla^2 A_x)\widehat{x} + (\nabla^2 A_y)\widehat{y} + (\nabla^2 A_z)\widehat{z} \qquad (F3.7)$$

F4 - Coordinate cilindriche

Un punto P é individuato, in un sistema di riferimento ortogonale, dalla terna: $P \equiv (\rho, \phi, z)$.

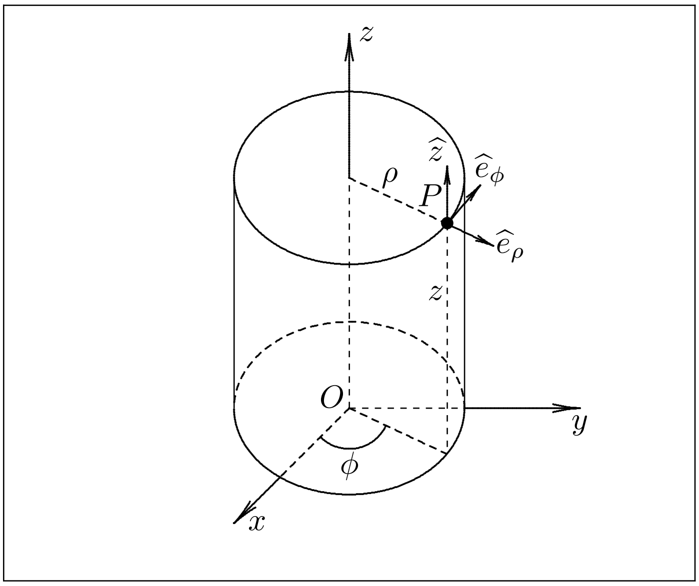

fig.F4-1

Tali coordinate sono legate alle coordinate cartesiane ortogonali dalle relazioni:

$$x = \rho \cos \phi; \quad y = \rho \sin \phi; \quad z = z \tag{F4.1}$$

Le formule di trasformazione dei versori sono:

$$\hat{e}_\rho = \hat{x} \cos \phi + \hat{y} \sin \phi; \quad \hat{e}_\phi = -\hat{x} \sin \phi + \hat{y} \cos \phi; \quad \hat{z} = \hat{z} \tag{F4.2}$$

$$\hat{x} = \hat{e}_\rho \cos \phi - \hat{e}_\phi \sin \phi; \quad \hat{y} = \hat{e}_\rho \sin \phi + \hat{e}_\phi \cos \phi; \quad \hat{z} = \hat{z} \tag{F4.3}$$

Le relazioni di moltiplicazione fra i vettori assumono la forma seguente:

$$\vec{A} \cdot \vec{B} = A_\rho B_\rho + A_\phi B_\phi + A_z B_z \tag{F4.4}$$

$$\vec{A} \times \vec{B} = (A_\phi B_z - A_z B_\phi)\hat{e}_\rho + (A_z B_\rho - A_\rho B_z)\hat{e}_\phi + (A_\rho B_\phi - A_\phi B_\rho)\hat{z} \tag{F4.5}$$

Gli operatori differenziali si scrivono:

$$\vec{\nabla}\Phi = \frac{\partial \Phi}{\partial \rho}\hat{e}_\rho + \frac{1}{\rho}\frac{\partial \Phi}{\partial \phi}\hat{e}_\phi + \frac{\partial \Phi}{\partial z}\hat{z} \tag{F4.6}$$

$$\nabla^2 \Phi = \frac{1}{\rho}\frac{\partial}{\partial \rho}\left(\rho \frac{\partial \Phi}{\partial \rho}\right) + \frac{1}{\rho^2}\frac{\partial^2 \Phi}{\partial \phi^2} + \frac{\partial^2 \Phi}{\partial z^2} \tag{F4.7}$$

$$\vec{\nabla} \cdot \vec{A} = \frac{1}{\rho}\frac{\partial}{\partial \rho}(\rho A_\rho) + \frac{1}{\rho}\frac{\partial A_\phi}{\partial \phi} + \frac{\partial A_z}{\partial z} \tag{F4.8}$$

$$\vec{\nabla} \times \vec{A} = \left(\frac{1}{\rho} \frac{\partial A_z}{\partial \phi} - \frac{\partial A_\phi}{\partial z} \right) \widehat{e}_\rho + \left(\frac{\partial A_\rho}{\partial z} - \frac{\partial A_z}{\partial \rho} \right) \widehat{e}_\phi + \frac{1}{\rho} \left(\frac{\partial}{\partial \rho} (\rho A_\phi) - \frac{\partial A_\rho}{\partial \phi} \right) \widehat{z} \quad (F4.9)$$

$$\nabla^2 \vec{A} = \left(\nabla^2 A_\rho - \frac{A_\rho}{\rho^2} - \frac{2}{\rho^2} \frac{\partial A_\phi}{\partial \phi} \right) \widehat{e}_\rho + \left(\nabla^2 A_\phi - \frac{A_\phi}{\rho^2} + \frac{2}{\rho^2} \frac{\partial A_\rho}{\partial \phi} \right) \widehat{e}_\phi + \left(\nabla^2 A_z \right) \widehat{z} \quad (F4.10)$$

F5 - Coordinate sferiche

Un punto P é individuato, in un sistema di riferimento ortogonale, dalla terna: $P \equiv (r, \theta, \phi)$.

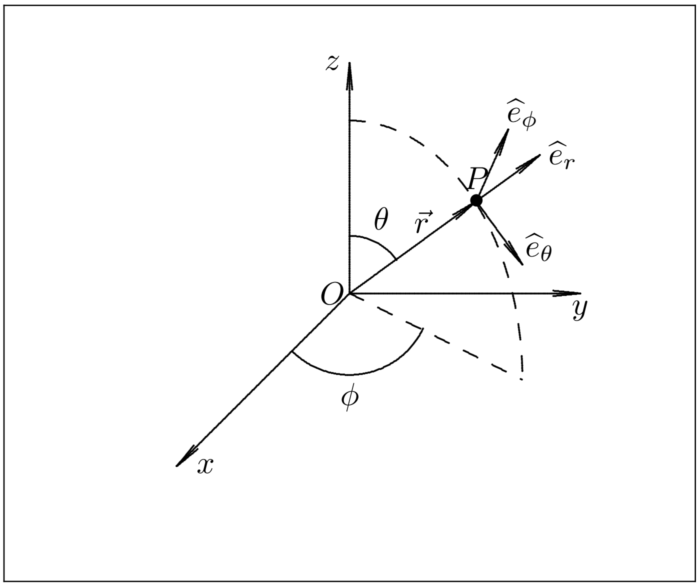

fig.F5-1

Tali coordinate sono legate alle coordinate cartesiane ortogonali dalle relazioni:

$$x = r \sin\theta \cos\phi; \quad y = r \sin\theta \sin\phi; \quad z = r \cos\theta \quad (F5.1)$$

Le formule di trasformazione dei versori sono:

$$\begin{aligned} \widehat{e}_r &= \widehat{x} \sin\theta \cos\phi + \widehat{y} \sin\theta \sin\phi + \widehat{z} \cos\theta \\ \widehat{e}_\theta &= \widehat{x} \cos\theta \cos\phi + \widehat{y} \cos\theta \sin\phi - \widehat{z} \sin\theta \\ \widehat{e}_\phi &= -\widehat{x} \sin\phi + \widehat{y} \cos\phi \end{aligned} \quad (F5.2)$$

$$\begin{aligned} \widehat{x} &= \widehat{e}_r \sin\theta \cos\phi + \widehat{e}_\theta \cos\theta \cos\phi - \widehat{e}_\phi \sin\phi \\ \widehat{y} &= \widehat{e}_r \sin\theta \sin\phi + \widehat{e}_\theta \cos\theta \sin\phi + \widehat{e}_\phi \cos\phi \\ \widehat{z} &= \widehat{e}_r \cos\theta - \widehat{e}_\theta \sin\theta \end{aligned} \quad (F5.3)$$

Le relazioni di moltiplicazione fra i vettori assumono la forma seguente:

$$\vec{A}\cdot\vec{B} = A_r B_r + A_\theta B_\theta + A_\phi B_\phi \tag{F5.4}$$

$$\vec{A}\times\vec{B} = (A_\theta B_\phi - A_\phi B_\theta)\widehat{e}_r + (A_\phi B_r - A_r B_\phi)\widehat{e}_\theta + (A_r B_\theta - A_\theta B_r)\widehat{e}_\phi \tag{F5.5}$$

Gli operatori differenziali si scrivono:

$$\vec{\nabla}\Phi = \frac{\partial \Phi}{\partial r}\widehat{e}_r + \frac{1}{r}\frac{\partial \Phi}{\partial \theta}\widehat{e}_\theta + \frac{1}{r\sin\theta}\frac{\partial \Phi}{\partial \phi}\widehat{e}_\phi \tag{F5.6}$$

$$\nabla^2\Phi = \frac{1}{r^2}\frac{\partial}{\partial r}\left(r^2\frac{\partial \Phi}{\partial r}\right) + \frac{1}{r^2\sin\theta}\frac{\partial}{\partial \theta}\left(\sin\theta\frac{\partial \Phi}{\partial \theta}\right) + \frac{1}{r^2\sin^2\theta}\frac{\partial^2 \Phi}{\partial \phi^2} \tag{F5.7}$$

$$\vec{\nabla}\cdot\vec{A} = \frac{1}{r^2}\frac{\partial}{\partial r}(r^2 A_r) + \frac{1}{r\sin\theta}\frac{\partial}{\partial \theta}(\sin\theta A_\theta) + \frac{1}{r\sin\theta}\frac{\partial A_\phi}{\partial \phi} \tag{F5.8}$$

$$\begin{aligned}\vec{\nabla}\times\vec{A} =& \frac{1}{r\sin\theta}\left[\frac{\partial}{\partial \theta}(\sin\theta A_\phi) - \frac{\partial A_\theta}{\partial \phi}\right]\widehat{e}_r + \frac{1}{r}\left[\frac{1}{\sin\theta}\frac{\partial A_r}{\partial \phi} - \frac{\partial}{\partial r}(rA_\phi)\right]\widehat{e}_\theta + \\ &+ \frac{1}{r}\left[\frac{\partial}{\partial r}(rA_\theta) - \frac{\partial A_r}{\partial \theta}\right]\widehat{e}_\phi\end{aligned} \tag{F5.9}$$

$$\begin{aligned}\nabla^2\vec{A} =& \left(\nabla^2 A_r - \frac{2A_r}{r^2} - \frac{2\cot\theta}{r^2}A_\theta - \frac{2}{r^2}\frac{\partial A_\theta}{\partial \theta} - \frac{2}{r^2\sin\theta}\frac{\partial A_\phi}{\partial \phi}\right)\widehat{e}_r + \\ &+ \left(\nabla^2 A_\theta - \frac{1}{r^2\sin^2\theta}A_\theta + \frac{2}{r^2}\frac{\partial A_r}{\partial \theta} - \frac{2\cos\theta}{r^2\sin^2\theta}\frac{\partial A_\phi}{\partial \phi}\right)\widehat{e}_\theta + \\ &+ \left(\nabla^2 A_\phi + \frac{2}{r^2\sin\theta}\frac{\partial A_r}{\partial \phi} - \frac{1}{r^2\sin^2\theta}A_\phi + \frac{2\cos\theta}{r^2\sin^2\theta}\frac{\partial A_\theta}{\partial \phi}\right)\widehat{e}_\phi\end{aligned} \tag{F5.10}$$

F6 - Seno e coseno integrali per argomenti πx †

x	$Si(\pi x)$	$Cin(\pi x)$	x	$Si(\pi x)$	$Cin(\pi x)$
0.0	0.0000000	0.0000000	5.0	1.6339648	3.3274223
0.1	0.3124418	0.0245728	5.1	1.6308898	3.3667050
0.2	0.6147001	0.0970867	5.2	1.6221192	3.4033581
0.3	0.8971892	0.2140075	5.3	1.6087121	3.4358268
0.4	1.1514774	0.3697010	5.4	1.5921299	3.4629782
0.5	1.3707622	0.5567977	5.5	1.5740824	3.4841947
0.6	1.5502335	0.7666663	5.6	1.5563575	3.4994145
0.7	1.6872994	0.9899593	5.7	1.5406482	3.5091189
0.8	1.7816612	1.2171942	5.8	1.5283953	3.5142689
0.9	1.8352365	1.4393268	5.9	1.5206596	3.5161981
1.0	1.8519370	1.6482775	6.0	1.5180339	3.5164744
1.1	1.8373228	1.8373748	6.1	1.5206020	3.5167438
1.2	1.7981590	2.0016851	6.2	1.5279477	3.5185725
1.3	1.7419110	2.1382122	6.3	1.5392104	3.5233006
1.4	1.6762168	2.2459541	6.4	1.5531817	3.5319230
1.5	1.6083727	2.3258182	6.5	1.5684312	3.5450055
1.6	1.5448736	2.3804096	6.6	1.5834497	3.5626455
1.7	1.4910351	2.4137098	6.7	1.5967962	3.5844772
1.8	1.4507237	2.4306775	6.8	1.6072330	3.6097210
1.9	1.4262105	2.4368030	6.9	1.6138385	3.6372715
2.0	1.4181516	2.4376534	7.0	1.6160855	3.6658126
2.1	1.4256913	2.4384423	7.1	1.6138808	3.6939505
2.2	1.4466738	2.4436573	7.2	1.6075618	3.7203497
2.3	1.4779403	2.4567695	7.3	1.5978521	3.7438598
2.4	1.5156840	2.4800447	7.4	1.5857813	3.7636213
2.5	1.5558310	2.5144640	7.5	1.5725788	3.7791401
2.6	1.5944160	2.5597553	7.6	1.5595496	3.7903264
2.7	1.6279216	2.6145259	7.7	1.5479481	3.7974922
2.8	1.6535562	2.6764793	7.8	1.5388584	3.8013121
2.9	1.6694505	2.7426941	7.9	1.5330950	3.8027491
3.0	1.6747618	2.8099376	8.0	1.5311313	3.8029556
3.1	1.6696811	2.8749849	8.1	1.5330626	3.8031583
3.2	1.6553502	2.9349177	8.2	1.5386067	3.8045388
3.3	1.6336982	2.9873763	8.3	1.5471399	3.8081216
3.4	1.6072188	3.0307473	8.4	1.5577652	3.8146797
3.5	1.5787092	3.0642725	8.5	1.5694054	3.8246668
3.6	1.5509962	3.0880751	8.6	1.5809106	3.8381815

† Handbook of Mathematical functions edited by Milton Abramowitz and Irene A. Stegun, pag.244.

3.7	1.5266749	3.1031038	8.7	1.5911706	3.8549661
3.8	1.5078819	3.1110053	8.8	1.5992211	3.8744405
3.9	1.4961220	3.1139395	8.9	1.6043329	3.8957652
4.0	1.4921612	3.1143565	9.0	1.6060769	3.9179284
4.1	1.4959924	3.1147582	9.1	1.6043585	3.9398477
4.2	1.5068740	3.1174660	9.2	1.5994200	3.9604761
4.3	1.5234340	3.1244161	9.3	1.5918091	3.9789022
4.4	1.5438274	3.1369991	9.4	1.5823200	3.9944358
4.5	1.5659304	3.1559579	9.5	1.5719116	4.0066694
4.6	1.5875515	3.1813484	9.6	1.5616112	4.0155122
4.7	1.6066404	3.2125674	9.7	1.5524146	4.0211922
4.8	1.6214745	3.2484385	9.8	1.5451900	4.0242280
4.9	1.6308069	3.2873492	9.9	1.5405974	4.0253729
5.0	1.6339648	3.3274223	10.0	1.5390291	4.0255378

F7 - Integrali di Fresnel †: $\mathscr{C}(x) = \int_0^x \cos\left(\frac{\pi}{2}t^2\right)\, dt \qquad \mathscr{S}(x) = \int_0^x \sin\left(\frac{\pi}{2}t^2\right)\, dt$

$$0 \le x \le 2$$

x	$\mathscr{C}(x)$	$\mathscr{S}(x)$	x	$\mathscr{C}(x)$	$\mathscr{S}(x)$
0.00	0.0000000	0.0000000	1.00	0.7798934	0.4382591
0.02	0.0200000	0.0000042	1.02	0.7792611	0.4582458
0.04	0.0400000	0.0000335	1.04	0.7773501	0.4781508
0.06	0.0599998	0.0001131	1.06	0.7741434	0.4978884
0.08	0.0799992	0.0002681	1.08	0.7696303	0.5173686
0.10	0.0999975	0.0005236	1.10	0.7638067	0.5364979
0.12	0.1199939	0.0009047	1.12	0.7566760	0.5551792
0.14	0.1399867	0.0014367	1.14	0.7482494	0.5733128
0.16	0.1599741	0.0021444	1.16	0.7385468	0.5907966
0.18	0.1799534	0.0030531	1.18	0.7275968	0.6075274
0.20	0.1999211	0.0041876	1.20	0.7154377	0.6234009
0.22	0.2198729	0.0055730	1.22	0.7021176	0.6383134
0.24	0.2398036	0.0072340	1.24	0.6876947	0.6521619
0.26	0.2597070	0.0091954	1.26	0.6722378	0.6648456
0.28	0.2795756	0.0114816	1.28	0.6558263	0.6762672
0.30	0.2994010	0.0141170	1.30	0.6385505	0.6863333
0.32	0.3191731	0.0171256	1.32	0.6205111	0.6949562
0.34	0.3388806	0.0205311	1.34	0.6018195	0.7020550
0.36	0.3585109	0.0243568	1.36	0.5825973	0.7075567
0.38	0.3780496	0.0286255	1.38	0.5629759	0.7113977
0.40	0.3974808	0.0333594	1.40	0.5430958	0.7135251
0.42	0.4167868	0.0385802	1.42	0.5231058	0.7138977
0.44	0.4359482	0.0443085	1.44	0.5031623	0.7124878
0.46	0.4549440	0.0505642	1.46	0.4834280	0.7092816
0.48	0.4737510	0.0573663	1.48	0.4640705	0.7042812
0.50	0.4923442	0.0647324	1.50	0.4452612	0.6975050
0.52	0.5106969	0.0726789	1.52	0.4271732	0.6889888
0.54	0.5287801	0.0812206	1.54	0.4099799	0.6787867
0.56	0.5465630	0.0903708	1.56	0.3938529	0.6669713
0.58	0.5640131	0.1001409	1.58	0.3789596	0.6536346
0.60	0.5810954	0.1105402	1.60	0.3654617	0.6388877

† Handbook of Mathematical functions edited by Milton Abramowitz and Irene A. Stegun, pag.321.

0.62	0.5977737	0.1215759	1.62	0.3535120	0.6228607
0.64	0.6140094	0.1332528	1.64	0.3432529	0.6057026
0.66	0.6297625	0.1455729	1.66	0.3348132	0.5875804
0.68	0.6449912	0.1585354	1.68	0.3283061	0.5686783
0.70	0.6596524	0.1721365	1.70	0.3238269	0.5491960
0.72	0.6737012	0.1863689	1.72	0.3214502	0.5293473
0.74	0.6870920	0.2012221	1.74	0.3212283	0.5093584
0.76	0.6997779	0.2166816	1.76	0.3231887	0.4894649
0.78	0.7117113	0.2327288	1.78	0.3273325	0.4699094
0.80	0.7228442	0.2493414	1.80	0.3336329	0.4509388
0.82	0.7331283	0.2664922	1.82	0.3420339	0.4328006
0.84	0.7425154	0.2841498	1.84	0.3524496	0.4157397
0.86	0.7509579	0.3022780	1.86	0.3647635	0.3999944
0.88	0.7584090	0.3208355	1.88	0.3788293	0.3857925
0.90	0.7648230	0.3397763	1.90	0.3944705	0.3733473
0.92	0.7701563	0.3590493	1.92	0.4114824	0.3628537
0.94	0.7743672	0.3785981	1.94	0.4296333	0.3544837
0.96	0.7774168	0.3983612	1.96	0.4486669	0.3483830
0.98	0.7792695	0.4182721	1.98	0.4683056	0.3446665
1.00	0.7798934	0.4382591	2.00	0.4882534	0.3434157

$$2 \leq x \leq 4$$

x	$\mathscr{C}(x)$	$\mathscr{S}(x)$	x	$\mathscr{C}(x)$	$\mathscr{S}(x)$
2.00	0.4882534	0.3434157	3.00	0.6057208	0.4963130
2.02	0.5082004	0.3446748	3.02	0.6038373	0.5161942
2.04	0.5278273	0.3484487	3.04	0.5982378	0.5353629
2.06	0.5468106	0.3547004	3.06	0.5891011	0.5531195
2.08	0.5648279	0.3633498	3.08	0.5767401	0.5688028
2.10	0.5815641	0.3742734	3.10	0.5615939	0.5818159
2.12	0.5967175	0.3873037	3.12	0.5442158	0.5916511
2.14	0.6100060	0.4022309	3.14	0.5252553	0.5979129
2.16	0.6211732	0.4188045	3.16	0.5054356	0.6003366
2.18	0.6299953	0.4367363	3.18	0.4855276	0.5988034
2.20	0.6362860	0.4557046	3.20	0.4663203	0.5933495
2.22	0.6399031	0.4753585	3.22	0.4485896	0.5841697
2.24	0.6407525	0.4953241	3.24	0.4330655	0.5716147
2.26	0.6387928	0.5152111	3.26	0.4204005	0.5561806
2.28	0.6340383	0.5346203	3.28	0.4111397	0.5384935

2.30	0.6265617	0.5531516	3.30	0.4056944	0.5192861
2.32	0.6164945	0.5704128	3.32	0.4043199	0.4993695
2.34	0.6040269	0.5860284	3.34	0.4070996	0.4796004
2.36	0.5894065	0.5996489	3.36	0.4139366	0.4608446
2.38	0.5729344	0.6109596	3.38	0.4245518	0.4439382
2.40	0.5549614	0.6196900	3.40	0.4384917	0.4296495
2.42	0.5358811	0.6256211	3.42	0.4551437	0.4186411
2.44	0.5161229	0.6285938	3.44	0.4737596	0.4114369
2.46	0.4961428	0.6285143	3.46	0.4934870	0.4083928
2.48	0.4764135	0.6253598	3.48	0.5134062	0.4096754
2.50	0.4574130	0.6191818	3.50	0.5325724	0.4152480
2.52	0.4396132	0.6101076	3.52	0.5500611	0.4248672
2.54	0.4234672	0.5983406	3.54	0.5650132	0.4380883
2.56	0.4093965	0.5841575	3.56	0.5766802	0.4542817
2.58	0.3977791	0.5679042	3.58	0.5844643	0.4726592
2.60	0.3889375	0.5499893	3.60	0.5879533	0.4923095
2.62	0.3831273	0.5308753	3.62	0.5869464	0.5122412
2.64	0.3805280	0.5110679	3.64	0.5814710	0.5314321
2.66	0.3812350	0.4911035	3.66	0.5717875	0.5488815
2.68	0.3852532	0.4715352	3.68	0.5583818	0.5636638
2.70	0.3924940	0.4529175	3.70	0.5419457	0.5749804
2.72	0.4027739	0.4357898	3.72	0.5233449	0.5822056
2.74	0.4158168	0.4206603	3.74	0.5035770	0.5849261
2.76	0.4312585	0.4079890	3.76	0.4837194	0.5829692
2.78	0.4486546	0.3981724	3.78	0.4648719	0.5764191
2.80	0.4674917	0.3915284	3.80	0.4480949	0.5656187
2.82	0.4872004	0.3882841	3.82	0.4343486	0.5511574
2.84	0.5071721	0.3885643	3.84	0.4244343	0.5338432
2.86	0.5267766	0.3923850	3.86	0.4189443	0.5146622
2.88	0.5453821	0.3996480	3.88	0.4182216	0.4947245
2.90	0.5623764	0.4101406	3.90	0.4223327	0.4752024
2.92	0.5771878	0.4235387	3.92	0.4310568	0.4572613
2.94	0.5893060	0.4394139	3.94	0.4438917	0.4419892
2.96	0.5983019	0.4572445	3.96	0.4600770	0.4303279
2.98	0.6038456	0.4764306	3.98	0.4786351	0.4230117
3.00	0.6057208	0.4963130	4.00	0.4984260	0.4205158

$$4 \le x \le 5$$

x	$\mathscr{C}(x)$	$\mathscr{S}(x)$	x	$\mathscr{C}(x)$	$\mathscr{S}(x)$
4.00	0.4984260	0.4205158	4.50	0.5260259	0.4342730

4.02	0.5182154	0.4230199	4.52	0.5431811	0.4444234
4.04	0.5367505	0.4303900	4.54	0.5568046	0.4589736
4.06	0.5528404	0.4421781	4.56	0.5657827	0.4767689
4.08	0.5654347	0.4576445	4.58	0.5693657	0.4963756
4.10	0.5736956	0.4757983	4.60	0.5672367	0.5161923
4.12	0.5770588	0.4954571	4.62	0.5595481	0.5345797
4.14	0.5752776	0.5153214	4.64	0.5469186	0.5499967
4.16	0.5684474	0.5340587	4.66	0.5303913	0.5611328
4.18	0.5570075	0.5503941	4.68	0.5113538	0.5670244
4.20	0.5417192	0.5631989	4.70	0.4914265	0.5671455
4.22	0.5236206	0.5715723	4.72	0.4723271	0.5614619
4.24	0.5039608	0.5749103	4.74	0.4557230	0.5504452
4.26	0.4841163	0.5729547	4.76	0.4430830	0.5350416
4.28	0.4654961	0.5658205	4.78	0.4355428	0.5165982
4.30	0.4494412	0.5539959	4.80	0.4337966	0.4967502
4.32	0.4371250	0.5383155	4.82	0.4380247	0.4772800
4.34	0.4294640	0.5199077	4.84	0.4478669	0.4599575
4.36	0.4270439	0.5001173	4.86	0.4624440	0.4463774
4.38	0.4300679	0.4804108	4.88	0.4804290	0.4378082
4.40	0.4383329	0.4622680	4.90	0.5001610	0.4350674
4.42	0.4512359	0.4470706	4.92	0.5197951	0.4384348
4.44	0.4678105	0.4359933	4.94	0.5374734	0.4476156
4.46	0.4867941	0.4299086	4.96	0.5515025	0.4617567
4.48	0.5067195	0.4293116	4.98	0.5605194	0.4795178
4.50	0.5260259	0.4342730	5.00	0.5636312	0.4991914

Per $x > 5$ é valida la seguente formula:

$$\begin{matrix}\mathscr{C}(x)\\ \mathscr{S}(x)\end{matrix} = 0.5 \pm \left(0.3183099 - \frac{0.0968}{x^4}\right)\frac{\begin{matrix}\sin\\ \cos\end{matrix}\left(\frac{\pi}{2}x^2\right)}{x} - \left(0.10132 - \frac{0.154}{x^4}\right)\frac{\begin{matrix}\sin\\ \cos\end{matrix}\left(\frac{\pi}{2}x^2\right)}{x^3} + \epsilon(x)$$

con $\epsilon(x) < 10^{-7}$.

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