

Equazioni goniometriche

indice

1. Equazioni elementari [pag. 2](#)
2. Equazioni riconducibili ad elementari [pag. 7](#)
3. Equazioni di secondo grado [pag. 14](#)
4. Equazioni lineari in seno e coseno [pag. 16](#)
5. Equazioni omogenee in seno e coseno [pag. 18](#)
6. Equazioni simmetriche [pag. 20](#)
7. Equazioni risolubili mediante le formule goniometriche [pag. 20](#)
8. Equazioni con funzioni goniometriche inverse impegnativi [pag. 22](#)
9. Equazioni di riepilogo [pag. 23](#)

Gli esercizi sono proposti in ordine di difficoltà crescente

nota: in un file così lungo e complesso può accadere che sia presente un errore di diversa natura nonostante gli esercizi siano stati controllati più volte. Saremo grati di ricevere segnalazioni di eventuali refusi o suggerimenti di qualsiasi natura

1. equazioni elementari



1	$\sin x = 0$	$k\pi$
2	$\sin x = 1$	$\frac{\pi}{2} + 2k\pi$
3	$\sin x = \frac{\sqrt{2}}{2}$	$\frac{\pi}{4} + 2k\pi; \frac{3}{4}\pi + 2k\pi$
4	$\sin x = \frac{\sqrt{3}}{2}$	$\frac{\pi}{3} + 2k\pi; \frac{2}{3}\pi + 2k\pi$
5	$\sin x = -\frac{1}{2}$	$\frac{7}{6}\pi + 2k\pi; -\frac{\pi}{6} + 2k\pi$
6	$\sin x = -\frac{\sqrt{2}}{2}$	$\frac{5}{4}\pi + 2k\pi; -\frac{\pi}{4} + 2k\pi$
7	$\cos x = 0$	$\frac{\pi}{2} + 2k\frac{\pi}{2}$
8	$\cos x = \frac{1}{2}$	$\pm\frac{\pi}{3} + 2k\pi$
9	$\cos x = \frac{\sqrt{3}}{2}$	$\pm\frac{\pi}{6} + 2k\pi$
10	$\cos x = 1$	$2k\pi$
11	$\sin x = \frac{1}{2}$	$\frac{\pi}{6} + 2k\pi; \frac{5}{6}\pi + 2k\pi$
12	$\cos x = \frac{\sqrt{2}}{2}$	$\pm\frac{\pi}{4} + 2k\pi$

13	$\cos x = -\frac{1}{2}$	$\pm \frac{2}{3}\pi + 2k\pi$
14	$\sin x = -1$	$-\frac{\pi}{2} + 2k\pi$
15	$\cos x = -1$	$\pi + 2k\pi$
16	$\cos x = -\frac{\sqrt{3}}{2}$	$\pm \frac{5}{6}\pi + 2k\pi$
17	$\sin x = -\frac{\sqrt{3}}{2}$	$\frac{4}{3}\pi + 2k\pi; \frac{5}{3}\pi + 2k\pi$
18	$\tan x = 0$	$k\pi$
19	$\tan x = \sqrt{3}$	$\frac{\pi}{3} + k\pi$
20	$\tan x = \frac{\sqrt{3}}{3}$	$\frac{\pi}{6} + k\pi$
21	$\tan x = 1$	$\frac{\pi}{4} + k\pi$
22	$\cot x = -\sqrt{3}$	$\frac{5}{6}\pi + k\pi$
23	$\cot x = \frac{\sqrt{3}}{3}$	$\frac{\pi}{3} + k\pi$
24	$\cot x = 1$	$\frac{\pi}{4} + k\pi$

25	$\cot x = -1$	$-\frac{\pi}{4} + k\pi$
26	$\tan x = -1$	$\frac{3}{4}\pi + k\pi$
27	$\tan x = -\sqrt{3}$	$\frac{2}{3}\pi + k\pi$
28	$\cot x = 0$	$\frac{\pi}{2} + k\pi$
29	$\cot x = -\frac{\sqrt{3}}{3}$	$\frac{2}{3}\pi + k\pi$
30	$ \sin x = 1$	$\frac{\pi}{2} + k\pi$
31	$ \tan x - 1 = 0$	$\frac{\pi}{4} + k\pi$
32	$ \tan x = 1$	$\frac{\pi}{4} + k\frac{\pi}{2}$
33	$ \cot x = \sqrt{3}$	$\pm\frac{\pi}{6} + k\pi$
34	$ \cos x = \frac{\sqrt{2}}{2}$	$\frac{\pi}{4} + k\frac{\pi}{2}$
35	$\sec x = 0$	<i>impossibile</i>
36	$\sec x = 1$	$2k\pi$

37	$\sec x = -1$	$\pi + 2k\pi$
38	$\sec x = \frac{1}{2}$	<i>impossibile</i>
39	$\csc x = 1$	$\frac{\pi}{2} + 2k\pi$
40	$\csc x = -1$	$\frac{3}{2}\pi + 2k\pi$
41	$\csc x = 0$	<i>impossibile</i>
42	$\csc x = \frac{\sqrt{3}}{3}$	<i>impossibile</i>
43	$\csc x = 2$	$\frac{\pi}{6} + 2k\pi ; \frac{5}{6}\pi + 2k\pi$
44	$2\cos x + 1 = 0$	$\pm \frac{2}{3}\pi + 2k\pi$
45	$6\sin x + 7 = 0$	<i>impossibile</i>
46	$3\tan x + \sqrt{3} = 0$	$\frac{5}{6}\pi + k\pi$
47	$2\cos x - 4 = 3(\cos x - 1)$	$\pi + 2k\pi$
48	$2\cot x + 2 = 3\cot x - \sqrt{3}$	$\frac{\pi}{12} + k\pi$

49	$2(\cot x - 1) + \sqrt{3} = 1 - (3 - \cot x)$	$\frac{5}{6}\pi + k\pi$
50	$5\cos x - 3 = 4(\cos x - 2)$	<i>impossibile</i>
51	$4(\sin x - 1) + 5 = 2\sin x + 9 + 5(\sin x - 1)$	$\frac{3}{2}\pi + 2k\pi$
52	$4\left(\tan x - \frac{\sqrt{3}}{4}\right) = 3\tan x + 2$	$\frac{5}{12}\pi + k\pi$
53	$4\sin 30^\circ \cdot \cos x + \cos 60^\circ = \tan 135^\circ - \sin 30^\circ$	$\pi + 2k\pi$
54	$2\sin x - \cos 180^\circ = 2(\sqrt{5}\cos 60^\circ - \sin x)$	$\frac{\pi}{10} + 2k\pi; \frac{9}{10}\pi + 2k\pi$
55	$3(\tan x + 1) + 2(1 - \tan x) = 2(\tan x - 1) + 8$	$\frac{3}{4}\pi + k\pi$
56	$2(\tan x + 1) + \cos 180^\circ(\tan x + 2) = 4\tan x - \sqrt{3}\sin 90^\circ$	$\frac{\pi}{6} + k\pi$
57	$\tan x = \frac{1}{5}\sqrt{25 - 10\sqrt{5}}$	$\frac{\pi}{10} + k\pi$
58	$\tan x = -\frac{1}{5}\sqrt{25 - 10\sqrt{5}}$	$-\frac{\pi}{10} + k\pi$
59	$\sec x = 5$	$x = \pm \arccos \frac{1}{5} + 2k\pi$

60	$\csc x = 5$	$\arcsin \frac{1}{5} + 2k\pi; \pi - \arcsin \frac{1}{5} + 2k\pi$
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2. equazioni riconducibili ad elementari



61	$\sin(2x + 1) = \frac{1}{2}$	$\frac{\pi}{12} - \frac{1}{2} + k\pi; \frac{5}{12}\pi - \frac{1}{2} + k\pi$
62	$\cos(3x - 1) = 0$	$\frac{\pi}{6} + \frac{1}{3} + k\frac{\pi}{3}$
63	$\cos 5x = -\frac{1}{2}$	$\pm \frac{2}{15}\pi + \frac{2}{5}k\pi$
64	$\sin 3x = -\frac{\sqrt{3}}{2}$	$\frac{4}{9}\pi + \frac{2}{3}k\pi; -\frac{\pi}{9} + \frac{2}{3}k\pi$
65	$\sin \frac{1}{2}x = -1$	$3\pi + 4k\pi$
66	$\cos \frac{1}{3}x = 0$	$\frac{3}{2}\pi + 3k\pi$
67	$2 \cos 2x = 1$	$\pm \frac{\pi}{6} + k\pi$
68	$\cos \left(x + \frac{\pi}{4}\right) = \frac{1}{2}$	$\frac{\pi}{12} + 2k\pi; -\frac{7}{12}\pi + 2k\pi$
69	$\sin(3x + \pi) = 0$	$k\frac{\pi}{3}$
70	$2\cos(x - 45^\circ) = \sqrt{2}$	$k360^\circ; 90^\circ + k360^\circ$
71	$2\sin \left(3x + \frac{\pi}{3}\right) - \sqrt{3} = 0$	$\frac{2}{3}k\pi; \frac{\pi}{9} + \frac{2}{3}k\pi$

72	$\cos\left(2x + \frac{\pi}{6}\right) = -\frac{1}{2}$	$\frac{\pi}{4} + k\pi; -\frac{5}{12}\pi + k\pi$
73	$\sin\left(2x + \frac{\pi}{5}\right) = \frac{1}{2}$	$-\frac{\pi}{60} + k\pi; \frac{19}{60}\pi + k\pi$
74	$\cos\left(2x + \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$	$k\pi; -\frac{\pi}{4} + k\pi$
75	$\sin\left(x + \frac{\pi}{3}\right) = -1$	$\frac{7}{6}\pi + 2k\pi$
76	$\cos\frac{1}{2}x = -1$	$2\pi + 4k\pi$
77	$\cos\left(x - \frac{3}{4}\pi\right) = -\frac{\sqrt{3}}{2}$	$\frac{19}{12}\pi + 2k\pi; -\frac{\pi}{12} + 2k\pi$
78	$\cos\left(2x + \frac{\pi}{4}\right) = \frac{\sqrt{2}}{2}$	$k\pi; -\frac{\pi}{4} + k\pi$
79	$\cos\left(\frac{\pi}{12} - x\right) = 1$	$\frac{\pi}{12} + 2k\pi$
80	$\sin 3x = \frac{1}{2}$	$\frac{\pi}{18} + \frac{2}{3}k\pi; \frac{5}{19}\pi + \frac{2}{3}k\pi$
81	$2\sin 2x - \sqrt{3} = 0$	$\frac{\pi}{6} + k\pi; \frac{\pi}{3} + k\pi$
82	$\sin\left(x + \frac{\pi}{4}\right) = 0$	$-\frac{\pi}{4} + k\pi$
83	$\sin\left(2x - \frac{\pi}{3}\right) = -1$	$\frac{11}{12}\pi + k\pi$

84	$\left \sin \left(x + \frac{\pi}{3} \right) \right = 1$	$\frac{\pi}{6} + k\pi$
85	$\tan 2x = -1$	$\frac{3}{8}\pi + k\frac{\pi}{2}$
86	$\tan 3x = 1$	$\frac{\pi}{12} + k\frac{\pi}{3}$
87	$\tan(x - 60^\circ) = -\sqrt{3}$	$k180^\circ$
88	$\tan \left(2x + \frac{\pi}{3} \right) = -1$	$\frac{5}{24}\pi + k\frac{\pi}{2}$
89	$\cot(30^\circ + 2x) = \sqrt{3}$	$k90^\circ$
90	$\tan \left(\frac{2}{3}x + \frac{\pi}{2} \right) = -\frac{\sqrt{3}}{3}$	$\frac{\pi}{2} + \frac{3}{2}k\pi$
91	$\cot \left(x + \frac{2}{3}\pi \right) = -\sqrt{3}$	$\frac{\pi}{6} + k\pi$
92	$\cot \left(2x + \frac{\pi}{18} \right) = 0$	$\frac{2}{9}\pi + k\frac{\pi}{2}$
93	$\cot \left(3x + \frac{\pi}{4} \right) = -1$	$-\frac{\pi}{6} + k\frac{\pi}{3}$
94	$\sqrt{6} \cot \left(\frac{3}{5}x - \frac{\pi}{6} \right) = \sqrt{2}$	$\frac{5}{6}\pi + \frac{5}{3}k\pi$
95	$\cot \left(\frac{2}{3}x + \frac{\pi}{5} \right) = -\sqrt{3}$	$\frac{19}{20}\pi + \frac{3}{2}k\pi$

96	$\tan\left(x - \frac{\pi}{4}\right) = 1$	$\frac{\pi}{2} + k\pi$
97	$\cot\left(2x + \frac{\pi}{18}\right) = 0$	$\frac{2}{9}\pi + k\frac{\pi}{2}$
98	$\tan\left(3x + \frac{\pi}{6}\right) = -1$	$\frac{7}{36}\pi + k\frac{\pi}{3}$
99	$\cot\left(x + \frac{2}{3}\pi\right) = -\sqrt{3}$	$\frac{\pi}{6} + k\pi$
100	$\tan\left(x + \frac{\pi}{3}\right) = 0$	$-\frac{\pi}{3} + k\pi$
101	$\tan\frac{3}{10}\pi + 2k\pi = 1$	$\frac{9}{20}\pi + k\pi$
102	$\sin\left(2x - \frac{\pi}{3}\right) = \sin\left(x + \frac{2}{3}\pi\right)$	$\pi + 2k\pi; \frac{2}{9}\pi + \frac{2}{3}k\pi$
103	$\sin\left(3x - \frac{\pi}{5}\right) = -\sin\left(x + \frac{\pi}{4}\right)$	$-\frac{\pi}{80} + k\frac{\pi}{2}; \frac{29}{40}\pi + k\pi$
104	$\cos\left(-x + \frac{3}{4}\pi\right) = \cos\left(2x - \frac{\pi}{5}\right)$	$\frac{19}{60}\pi - \frac{2}{3}k\pi; -\frac{11}{20}\pi + 2k\pi$
105	$\cos(2x - 50^\circ) = \cos(10^\circ - x)$	$20^\circ + k120^\circ; 40^\circ + k360^\circ$
106	$\cos(3x - 15^\circ) = -\cos(2x - 5^\circ)$	$40^\circ + k72^\circ; -170^\circ + k360^\circ$
107	$\sin(2x - 30^\circ) = \cos(-x + 15^\circ)$	$105^\circ + k360^\circ; 45^\circ + k120^\circ$
108	$\sin x = \sin(x - 60^\circ)$	$120^\circ + k180^\circ$

109	$\sin 7x = \cos 5x$	$\frac{\pi}{24} + k\frac{\pi}{6}; \frac{\pi}{4} + k\pi$
110	$\sin 5x = -\cos 2x$	$-30^\circ + k120^\circ; -\frac{90^\circ}{7} + k\frac{360^\circ}{7}$
111	$\sin 3x = \cos 2x$	$18^\circ - k72^\circ; 90^\circ - k360^\circ$
112	$\cos 2x - \cos x = 0$	$\frac{2}{3}k\pi$
113	$\cos 3x = \cos 2x$	$\frac{2}{5}k\pi$
114	$\cos\left(2x - \frac{\pi}{10}\right) = \cos\left(x - \frac{\pi}{5}\right)$	$-\frac{\pi}{10} + 2k\pi; \frac{\pi}{10} + \frac{2}{3}k\pi$
115	$\cos\left(x - \frac{3}{4}\pi\right) = \cos\left(x - \frac{\pi}{12}\right)$	$-\frac{\pi}{3} + k\pi$
116	$\tan\left(2x - \frac{\pi}{6}\right) = \tan\left(x + \frac{\pi}{3}\right)$	$\frac{\pi}{2} + k\pi$
117	$\tan x = -\cot 3x$	$-\frac{\pi}{4} + k\frac{\pi}{2}$
118	$\tan(11x + 15^\circ) = \cot(54^\circ - 8x)$	$7^\circ + k60^\circ$
119	$\tan(2x - 18^\circ) = \tan(x + 12^\circ)$	$30^\circ + k180^\circ$
120	$\tan(3x - 15^\circ) = -\tan(2x - 25^\circ)$	$8^\circ + k36^\circ$
121	$\cot(-x) = -\cot\left(2x - \frac{\pi}{12}\right)$	$\frac{\pi}{12} - k\pi$

122	$\tan(4x - 55^\circ) = \cot(2x + 55^\circ)$	$15^\circ + k30^\circ$
123	$\tan\left(2x - \frac{\pi}{18}\right) = \cot\left(x + \frac{\pi}{3}\right)$	$\frac{1}{27}\pi + k\frac{\pi}{3}$
124	$\cos\left(\frac{\pi}{5} - x\right) + \sin\left(\frac{3}{10}\pi + x\right) = 0$	$-\frac{3}{10}\pi - k\pi$
125	$2\cot\left(\frac{\pi}{2} - x\right) + \tan(\pi - x) = \cot\left(\frac{3}{2}\pi - 2x\right)$	$-k\pi$
126	$\sin\left(x - \frac{\pi}{3}\right) = \sin 2x$	$-\frac{\pi}{3} + 2k\pi; \frac{4}{9}\pi + \frac{2}{3}k\pi$
127	$\sin\left(3x + \frac{\pi}{12}\right) = \sin x$	$-\frac{\pi}{24} + k\pi; \frac{11}{48}\pi + k\frac{\pi}{2}$
128	$\sin\left(\frac{\pi}{4} - x\right) = \sin\left(2x + \frac{\pi}{4}\right)$	$\frac{2}{3}k\pi; \frac{\pi}{2} + 2k\pi$
129	$\sin\left(2x + \frac{\pi}{4}\right) = \sin 3x$	$\frac{\pi}{4} + 2k\pi; \frac{3}{20}\pi + \frac{2}{5}k\pi$
130	$\cos\left(2x - \frac{\pi}{12}\right) = \cos\left(x + \frac{\pi}{3}\right)$	$\frac{5}{12}\pi + 2k\pi; -\frac{\pi}{12} + \frac{2}{3}k\pi$
131	$\tan 2x = \tan\left(x + \frac{\pi}{4}\right)$	<i>impossibile</i>
132	$\tan\left(x - \frac{\pi}{6}\right) = \tan\left(\frac{4}{3}\pi - x\right)$	$\frac{3}{4}\pi + k\frac{\pi}{2}$
133	$\cot\left(4x + \frac{\pi}{5}\right) = \cot\left(3x - \frac{\pi}{6}\right)$	$-\frac{11}{30}\pi + k\pi$
134	$\cot\left(x + \frac{7}{6}\pi\right) = \cot\left(\frac{5}{3}\pi - x\right)$	$\frac{\pi}{4} + k\frac{\pi}{2}$

135	$\tan\left(x + \frac{\pi}{3}\right) + \cot\left(\frac{\pi}{6} - x\right) = 2$	$-\frac{\pi}{12} + k\pi$
136	$\sin\left(\frac{\pi}{3} - x\right) + \cos\left(\frac{\pi}{6} + x\right) = 1$	$\frac{\pi}{6} + 2k\pi; -\frac{\pi}{2} + 2k\pi$
137	$\tan 2x + \tan x = 0$	$k\frac{\pi}{3}$
138	$\tan\left(x - \frac{\pi}{6}\right) + \tan x = 0$	$\frac{\pi}{12} + k\frac{\pi}{2}$
139	$\sin\left(2x - \frac{\pi}{3}\right) = \sin\left(\frac{\pi}{4} - 3x\right)$	$\frac{7}{60}\pi + k\frac{2}{5}\pi; -\frac{13}{12}\pi + 2k\pi$
140	$\cos\left(\frac{\pi}{2} + x\right) = \cos x$	$-\frac{\pi}{4} + k\pi$
141	$\tan(2x - \pi) = \tan\frac{x}{2}$	$\frac{2}{3}\pi + k\frac{2}{3}\pi$
142	$\cot(2x - \pi) = \cot\left(x + \frac{\pi}{3}\right)$	$\frac{4}{3}\pi + k\pi$
143	$\sin(2x - \pi) = \cos x$	$\frac{\pi}{2} + k\pi; -\frac{\pi}{6} + 2k\pi; \frac{7}{6}\pi + 2k\pi$
144	$\cos x = -\sin x$	$-\frac{\pi}{4} + k\pi$
145	$\tan\left(2x - \frac{\pi}{6}\right) = \cot\left(\frac{\pi}{6} - x\right)$	$\frac{\pi}{2} + k\pi$
146	$\cot\left(\frac{\pi}{2} - 3x\right) = -\tan\left(x + \frac{\pi}{3}\right)$	$-\frac{\pi}{12} + k\frac{\pi}{4}$

3. equazioni di secondo grado



147	$\sin^2 x - \sin x = 0$	$k\pi; \frac{\pi}{2} + 2k\pi$
148	$2\sin^2 x - 1 = 0$	$\frac{\pi}{4} + k\frac{\pi}{2}$
149	$2\sin^2 x + \sqrt{3}\sin x = 0$	$k\pi; -\frac{\pi}{3} + 2k\pi; -\frac{2}{3}\pi + 2k\pi$
150	$\cos^2 x + \cos x = 0$	$\frac{\pi}{2} + k\pi; \pi + 2k\pi$
151	$\cos^2 x - \cos x = 0$	$\frac{\pi}{2} + k\pi; 2k\pi$
152	$\tan^2 x + \tan x = 0$	$k\pi; \frac{3}{4}\pi + k\pi$
153	$2\cos^2 x + \sqrt{3}\cos x = 0$	$\pm\frac{5}{6}\pi + 2k\pi; \frac{\pi}{2} + k\pi$
154	$4\cos^2 2x - 3 = 0$	$\pm\frac{\pi}{12} + k\pi; \pm\frac{5}{12}\pi + k\pi$
155	$2\cos^2 x - 5\cos x + 2 = 0$	$\pm\frac{\pi}{3} + 2k\pi$
156	$2\sin^2 x - 7\sin x + 3 = 0$	$\frac{\pi}{6} + 2k\pi; \frac{5}{6}\pi + 2k\pi$
157	$2\cos^2 x - 3\cos x + 1 = 0$	$2k\pi; \pm\frac{\pi}{3} + 2k\pi$
158	$2\sin^2 x + 3\sin x + 1 = 0$	$\frac{3}{2}\pi + 2k\pi; \frac{7}{6}\pi + 2k\pi; \frac{11}{6}\pi + 2k\pi$
159	$4\sin^2 \frac{x}{2} + 3\sin \frac{x}{2} + 1 = 0$	$\frac{\pi}{3} + 4k\pi; \frac{5}{3}\pi + 4k\pi$

160	$\tan^2 x - (\sqrt{3} + 1)\tan x + \sqrt{3} = 0$	$\frac{\pi}{3} + k\pi; \frac{\pi}{4} + k\pi$
161	$4\sin^2 x - 1 = 0$	$\pm \frac{\pi}{6} + k\pi$
162	$3\tan^2 x - 1 = 0$	$\pm \frac{\pi}{6} + k\pi$
163	$\tan^2 x - \sqrt{3}\tan x = 0$	$k\pi; \frac{\pi}{3} + k\pi$
164	$\tan^2 x - 2\tan x + 1 = 0$	$\frac{\pi}{4} + k\pi$
165	$\cot^2 x + (1 - \sqrt{3})\cot x - \sqrt{3} = 0$	$\frac{\pi}{6} + k\pi; \frac{3}{4}\pi + k\pi$
166	$2\sin^2 x + \sin x - 1 = 0$	$\frac{\pi}{6} + 2k\pi; \frac{5}{6}\pi + 2k\pi; \frac{3}{2}\pi + 2k\pi$
167	$2\cos^2 x - 3\cos x + 1 = 0$	$\pm \frac{\pi}{3} + 2k\pi; 2k\pi$
168	$\tan^2 x + (1 - \sqrt{3})\tan x - \sqrt{3} = 0$	$-\frac{\pi}{4} + k\pi; \frac{\pi}{3} + k\pi$
169	$\cot^2 x - 2\cot x + 1 = 0$	$\frac{\pi}{4} + k\pi$
170	$\sin^2 x - 1 = 0$	$\frac{\pi}{2} + k\pi$
171	$4\cos^2 x - 3 = 0$	$\pm \frac{\pi}{6} + 2k\pi; \pm \frac{5}{6}\pi + 2k\pi$
172	$\tan^2 x - 1 = 0$	$\frac{\pi}{4} + k\frac{\pi}{2}$
173	$3\cot^2 x - 1 = 0$	$\pm \frac{\pi}{3} + k\pi$

174	$2\sin^2 x - \sqrt{2}\sin x = 0$	$\frac{\pi}{4} + 2k\pi; \frac{3}{4}\pi + 2k\pi; k\pi$
175	$\cos^2 x - \frac{\sqrt{2}}{2}\cos x = 0$	$\frac{\pi}{4} + k\pi; \frac{\pi}{2} + k\pi$
176	$\tan^2 x + \tan x = 0$	$k\pi; -\frac{\pi}{4} + k\pi$
177	$\cot^2 x + \cot x = 0$	$\frac{\pi}{2} + k\pi; -\frac{\pi}{4} + k\pi$

4. equazioni lineari in seno e coseno



178	$\sin x - \cos x = 0$	$\frac{\pi}{4} + k\pi$
179	$\sin x + \cos x = 0$	$-\frac{\pi}{4} + k\pi$
180	$3\sin x - \sqrt{3}\cos x = 0$	$\frac{\pi}{6} + k\pi$
181	$\sin x + \sqrt{3}\cos x = 0$	$-\frac{\pi}{3} + k\pi$
182	$\sin x - (2 + \sqrt{3})\cos x = 0$	$\frac{5}{12}\pi + k\pi$
183	$\sqrt{3}\sin x + 3\cos x = 0$	$-\frac{\pi}{3} + k\pi$
184	$\sqrt{3}\sin x + 3\cos x = 0$	$60^\circ + k180^\circ$
185	$\sin \frac{3}{2}x - \cos \frac{3}{2}x = 1$	$\frac{4}{3}k\pi; -\frac{\pi}{3} + \frac{4}{3}k\pi$
186	$\cos x + \sin x + \sqrt{2} = 0$	$\frac{5}{4}\pi + 2k\pi$

187	$\sqrt{3}\cos x + \sin x = 2$	$\frac{\pi}{6} + 2k\pi$
188	$\sqrt{3}\cos x + \sin x = \sqrt{3}$	$k360^\circ; 60^\circ + k360^\circ$
189	$\sin x - \cos x + 1 = 0$	$k360^\circ; 270^\circ + k360^\circ$
190	$\sin x + \cos x + 1 = 0$	$180^\circ + k360^\circ; 270^\circ + k360^\circ$
191	$\sin x + \cos x = \frac{\sqrt{2}}{2}$	$105^\circ + k360^\circ; 345^\circ + k360^\circ$
192	$\sin x - \cos x = \frac{\sqrt{2}}{2}$	$45^\circ + (-1)^k 30^\circ + k180^\circ$
193	$\sin 3x + \cos 3x = \sqrt{2}$	$15^\circ + k120^\circ$
194	$\sin x - \sqrt{3}\cos x = 2$	$150^\circ + k360^\circ$
195	$\sqrt{3}\sin x + \cos x + 1 = 0$	$\pi + 2k\pi; -\frac{\pi}{3} + 2k\pi$
196	$\sin x - \cos x - 1 = 0$	$\pi + 2k\pi; \frac{\pi}{2} + 2k\pi$
197	$3\sin x + \sqrt{3}\cos x + \sqrt{3} = 0$	$\pi + 2k\pi; -\frac{\pi}{3} + 2k\pi$
198	$2\cos x + 2\sin x - (\sqrt{3} + 1) = 0$	$\frac{\pi}{3} + 2k\pi; \frac{\pi}{6} + 2k\pi$
199	$\cos(90^\circ - x) + \sin(120^\circ - x) = \sqrt{3}$	$60^\circ + k360^\circ$
200	$\sin\left(\frac{5}{6}\pi - x\right) - \cos\left(\frac{4}{3}\pi - x\right) = 2$	$\frac{\pi}{3} + 2k\pi$

201	$\cos x + \sqrt{3} \sin x = 2$	$\frac{\pi}{3} + 2k\pi$
202	$\sin x + \cos x = \frac{1}{2}(\sqrt{3} + 1)$	$\frac{\pi}{6} + 2k\pi; \frac{\pi}{3} + 2k\pi$
203	$\cos\left(x - \frac{\pi}{2}\right) + \sin\left(x - \frac{3}{2}\pi\right) = \sqrt{2}$	$\frac{\pi}{4} + 2k\pi$
204	$\sin x - \cos x - \sqrt{2} = 0$	$\frac{3}{4}\pi + 2k\pi$
205	$\frac{\sqrt{3}}{2}\left(\cos^2 \frac{x}{2} - \frac{1 - \cos x}{2}\right) + \frac{1}{2}\sin x = 1$	$\frac{\pi}{6} + 2k\pi$
206	$\sqrt{3} \sin 4x + \cos 4x = 2$	$\frac{\pi}{12} + k\frac{\pi}{4}$
207	$2\sin(x - 90^\circ) - \cos(120^\circ + x) = 0$	$60^\circ + k180^\circ$
208	$\cos 2x + \sqrt{3} \sin 2x = 2$	$\frac{\pi}{6} + k\pi$
209	$\sqrt{3} \cos\left(\frac{3}{2}\pi + x\right) + \cos(x - \pi) = 2$	$\frac{2}{3}\pi + 2k\pi$
210	$\sin\left(\frac{5}{6}\pi - x\right) - \cos\left(\frac{4}{3}\pi - x\right) = 2$	$\frac{\pi}{3} + 2k\pi$

5. equazioni omogenee in seno e coseno



211	$\sqrt{3} \cos^2 x + \sin x \cos x = 0$	$\pm \frac{\pi}{2} + 2k\pi; -\frac{\pi}{3} + k\pi$
212	$3 \cos^2 x + \sqrt{3} \sin x \cos x = 0$	$\frac{\pi}{2} + k\pi; \frac{2}{3}\pi + k\pi$
213	$\sin^2 x - 3 \cos^2 x = 0$	$\pm \frac{\pi}{3} + k\pi$

214	$4\sin^2 x - 9\cos^2 x = 0$	$\pm \arctan \frac{3}{2} + k\pi$
215	$\sqrt{3}\sin^2 x - \sin x \cos x = 0$	$k\pi; \frac{\pi}{6} + k\pi$
216	$\sin^2 x + (\sqrt{3} - 2)\sin x \cos x = 0$	$k\pi; \frac{\pi}{12} + k\pi$
217	$2\sin x \cos x - 1 = 0$	$\frac{\pi}{4} + k\pi$
218	$4\sin x \cos x - 1 = 0$	$\frac{\pi}{12} + k\pi; \frac{5\pi}{12} + k\pi$
219	$2\sin x \cos x = \cos^2 x - \sin^2 x$	$22^\circ 30' + k90^\circ$
220	$3\sin^2 x - 2\sqrt{3}\sin x \cos x - 3\cos^2 x = -2\sqrt{3}$	$\frac{\pi}{12} + k\pi$
221	$\sin^2 x + \frac{3}{4}\cos^2 x + \frac{1}{4}\sin^2 x = \frac{\sqrt{3}}{2}\sin x \cos x + \frac{1}{2}$	$\frac{\pi}{6} + k\pi$
222	$5\sin^2 x - 2\sqrt{3}\cos x \sin x - \cos^2 x - 2 = 0$	$\frac{\pi}{3} + k\pi; \frac{5}{6}\pi + k\pi$
223	$\sin^2 x - 7\cos^2 x + 2\sqrt{2}\sin x \cos x = 4$	$\frac{\pi}{3} + k\pi; \frac{5}{6}\pi + k\pi$
224	$6\sin^2 x - 8\sin x \cos x + 4\cos^2 x - 1 = 0$	$\frac{\pi}{4} + k\pi; \arctan \frac{3}{5} + k\pi$
225	$2\sin^2 x + \sqrt{3}\sin x \cos x - \cos^2 x - 2 = 0$	$\pm \frac{\pi}{2} + 2k\pi; \frac{\pi}{3} + k\pi$

226	$2\cos^2 x + 2\cos x \sin x = \frac{\sqrt{3} + 3}{2}$	$\frac{\pi}{6} + k\pi; \frac{\pi}{12} + k\pi$
227	$2\sqrt{3}\sin x \left(\frac{\sqrt{3}}{2}\cos x - \frac{1}{2}\sin x \right) + \frac{\sqrt{3}}{2} = \sqrt{3}$	$\frac{\pi}{6} + k\pi$
228	$\frac{\sqrt{3}}{3}\cos^2 x + \sin x \cos x = \frac{\sqrt{3}}{3}$	$\frac{\pi}{3} + k\pi; k\pi$
229	$\sqrt{3}\sin^2 x - 2\sin x \cos x - \sqrt{3}\cos^2 x = 0$	$-\frac{\pi}{6} + k\pi; \frac{\pi}{3} + k\pi$
230	$3\sin^2 x - 8\sqrt{3}\sin x \cos x + 15\cos^2 x = 0$	$\frac{\pi}{3} + k\pi; \arctan \frac{5\sqrt{3}}{3}$
231	$3\sin^4 x - 4\sin^2 x \cos^2 x + \cos^4 x = 0$	$\pm \frac{\pi}{4} + k\pi; \pm \frac{\pi}{6} + k\pi$
232	$4\sin^2 x \cos^2 x - 4\cos^4 x = 0$	$\frac{\pi}{2} + k\pi; \frac{\pi}{4} + k\frac{\pi}{2}$

6. equazioni simmetriche



233	$\sin x + \cos x = 1$	$2k\pi; \frac{\pi}{2} + 2k\pi$
234	$\sin x + \cos x + 2\sin x \cos x + 1 = 0$	$-\frac{\pi}{2} + 2k\pi; -\frac{\pi}{4} + k\pi$
235	$\sin x + \cos x + 2\sin x \cos x - (1 + \sqrt{2}) = 0$	$\frac{\pi}{4} + 2k\pi$
236	$\sin^3 x + \cos^3 x = 0$	$-\frac{\pi}{4} + k\pi$

7. equazioni risolubili mediante le formule goniometriche



237	$\cos\left(\frac{\pi}{6} + x\right) + \cos\left(\frac{\pi}{6} - x\right) - \frac{3}{2} = 0$	$\pm \frac{\pi}{6} + 2k\pi$
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238	$2\sin\left(x - \frac{\pi}{4}\right) + 2\sin\left(x + \frac{\pi}{4}\right) = \sqrt{2}$	$\frac{\pi}{6} + 2k\pi; \frac{5}{6}\pi + 2k\pi$
239	$\tan\left(\frac{\pi}{6} + x\right) + \tan\left(\frac{\pi}{3} - x\right) = 2$	$\frac{\pi}{12} + k\pi$
240	$2\sin 2x - \tan x = 0$	$k\pi; \pm \frac{\pi}{3} + 2k\pi; \pm \frac{2}{3}\pi + 2k\pi$
241	$\sin 2x - \sin x = 0$	$k\pi; \pm \frac{\pi}{3} + 2k\pi$
242	$\sqrt{3}\cos x - \cos 2x - 1 = 0$	$\frac{\pi}{2} + k\pi; \pm \frac{\pi}{6} + 2k\pi$
243	$\cot x - \sin 2x = 0$	$\frac{\pi}{2} + k\pi; \frac{\pi}{4} + k\frac{\pi}{2}$
244	$\tan^2 \frac{x}{2} + 2\cos x - \frac{4}{3} = 0$	$\pm \frac{\pi}{3} + 2k\pi$
245	$\cos^2 \frac{x}{2} - \sin^2 \frac{x}{2} - \sqrt{2}\cos^2 x = 0$	$\frac{\pi}{2} + k\pi; \frac{\pi}{4} + k\pi$
246	$\tan^2 \frac{x}{2} = 4\sin^2 \frac{x}{2}$	$2k\pi; \pm \frac{2\pi}{3} + 2k\pi$
247	$\frac{1 - \cos x}{1 + \cos x} = 4\sin^2 \frac{x}{2}$	$2k\pi; \pm \frac{2}{3}\pi + 2k\pi$
248	$\sin 6x - \sin 4x = 2\sin x$	$k\pi; k\frac{2}{5}\pi$
249	$\sin 3x - \sin x = \cos 3x$	$\pm \frac{\pi}{6} + \frac{2}{3}k\pi; \frac{\pi}{12} + k\pi; \frac{5\pi}{12} + k\pi$
250	$\sin x \cos 3x = \sin 2x \cos 4x$	$k\pi; \frac{\pi}{10} + k\frac{\pi}{5}$

251	$\sin x \sin 2x = \sin 3x \sin 4x$	$k \frac{\pi}{2}; k \frac{\pi}{5}$
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8. equazioni con funzioni goniometriche inverse impegnative



252	$\sin\left(\arccos\left(x + \frac{\pi}{4}\right)\right) = \cos \frac{\pi}{3}$	$-\frac{\pi \pm 2\sqrt{3}}{4}$
253	$\cos\left(\arcsin x + \frac{\pi}{3}\right) = x$	$\frac{\sqrt{6} - \sqrt{2}}{4}$
254	$\tan(\arcsin x - \arccos x) = \frac{1}{x}$	<i>impossibile</i>
255	$\tan(\arcsin \sqrt{x}) = \sin(\arctan x)$	0
256	$\sin\left(\arcsin x + \frac{\pi}{6}\right) = \frac{x \tan \frac{\pi}{4}}{2}$	$-\frac{1}{\sqrt{5-2\sqrt{3}}}$
257	$\cos\left(\frac{\pi}{4} + \arctan \sqrt{x}\right) = 1$	<i>impossibile</i>
258	$\tan(\arcsin 5x) \tan(\arccos 5x) = 1$	$\left(-\frac{1}{5}, 0\right) \cup \left(0, \frac{1}{5}\right)$
259	$\sin(2 \arccos x) = \cos(2 \arcsin x)$	$-\frac{\sqrt{2+\sqrt{2}}}{2}; \frac{\sqrt{2-\sqrt{2}}}{2}$
260	$\tan\left(\arccos(\sin^2 x) + \frac{\pi}{2}\right) = -\sin^2 x$	$k\pi$
261	$\sin(\arccos(1-x) + \arcsin(1+x)) = k$	<i>impossibile</i>
262	$\sin\left(\arccos\left(x - \frac{1}{2}\right) - \arcsin\left(x + \frac{1}{2}\right)\right) = \frac{3}{4}$	$\pm \frac{\sqrt{70}}{28}$
263	$\sin(\arctan(\sin x) - \arccos(\sin x)) = \frac{1}{\sqrt{1+\sin^2 x}}$	$\frac{\pi}{2} + k\pi$

264	$\cos\left(\arcsin\sqrt{1+x} + \frac{\pi}{4}\right) = \frac{\sqrt{-2x}}{2}$	-1
265	$x \tan(2 \arctan x) + x^2 = -1 - \frac{5}{2\sqrt{3}}$	$\pm \frac{1+\sqrt{3}}{\sqrt{2}}$
266	$\sin(2 \arccos\sqrt{x-2}) = \tan\frac{x}{2} \sin x + \cos x$	$\frac{5}{2}$
267	$\cos\left(\frac{\pi}{3} + 2 \arcsin\frac{x}{13}\right) = \sqrt{1 - \frac{x^2}{169} - \frac{x^2}{338}}$	$3 - 4\sqrt{3}$
268	$\tan(\arctan x + \arctan 3x) = 2 \tan(\arctan x + \arctan 2x)$	$0; \pm \frac{\sqrt{5}}{5}$
269	$2 \sin(\arcsin x + \arcsin 3x) = 3(\arcsin x + \arcsin 2x)$	0
270	$6 \cos(\arccos 2x + \arccos 5x) = 5 \cos(\arccos 3x + \arccos 4x)$	$\pm \frac{\sqrt{4609}}{419}$
271	$\tan^2(\arcsin x) + \tan^2(\arccos x) = 3$	$\pm \frac{\sqrt{5-\sqrt{5}}}{\sqrt{10}}; \pm \frac{\sqrt{5+\sqrt{5}}}{\sqrt{10}}$

9. equazioni di riepilogo



272	$2\cos x - 5 = 0$	impossibile
273	$\sin^2 x + (1 - \sqrt{3})\sin x \cos x - \sqrt{3}\cos^2 x = 0$	$-\frac{\pi}{4} + k\pi; \frac{\pi}{3} + k\pi$
274	$3\sin^2 x + 7\sin x = 0$	$k\pi$
275	$\cos x = -\cos 2x$	$\frac{\pi}{3} + \frac{2}{3}k\pi$
276	$\sqrt{3}\sin x + \cos x = 1$	$2k\pi; \frac{2}{3}\pi + 2k\pi$

277	$\sqrt{3}\sin x \cos x - \cos^2 x = 0$	$\frac{\pi}{2} + k\pi; \frac{\pi}{6} + k\pi$
278	$\cos x + \sqrt{3}\sin x = -1$	$\pi + 2k\pi; -\frac{\pi}{3} + 2k\pi$
279	$5\sin^2 x - 3\sin x \cos x - 2\cos^2 x = 0$	$\frac{\pi}{4} + k\pi; -\arctan \frac{2}{5} + k\pi$
280	$3\tan^2 x + 2\sqrt{3}\tan x - 3 = 0$	$-\frac{\pi}{3} + k\pi; \frac{\pi}{6} + k\pi$
281	$\sin x - \sqrt{3}\cos x = 0$	$\frac{\pi}{3} + k\pi$
282	$\sin^2 x + \cos 2x = 1$	$k\pi$
283	$\sin 3x = \sin\left(\frac{2\pi}{3} + x\right)$	$\frac{\pi}{3} + k\pi; \frac{\pi}{12} + \frac{\pi}{2}k$
284	$\sin\left(x + \frac{\pi}{6}\right) - 2\cos x = 0$	$\frac{\pi}{3} + k\pi$
285	$\sin 3x + \sin x = 0$	$k\frac{\pi}{2}$
286	$\tan\left(x - \frac{\pi}{3}\right) = \cot\left(x + \frac{\pi}{3}\right)$	$\frac{\pi}{4} + k\frac{\pi}{2}$
287	$\cos x - 2\sin x \cos x - \sin x + 2\sin^2 x = 0$	$\frac{\pi}{6} + 2k\pi; -\frac{\pi}{6} + 2k\pi; \pm\frac{\pi}{4} + 2k\pi$
288	$\sin^4 x - \sin^2 x \cos^2 x - \sin^2 x + \cos^2 x = 0$	$\pm\frac{\pi}{4} + 2k\pi; \frac{\pi}{2} + k\pi$
289	$4\sin^2 x + \cos^2 x - 7 = 0$	<i>impossibile</i>
290	$2\sin^2 \frac{x}{2} - \sin 2x + \cos x = 0$	$\frac{\pi}{4} + k\pi$

291	$\sin x - \cos x + 1 = 2 \sin x \cos x$	$2k\pi; \frac{\pi}{4} + k\pi; -\frac{\pi}{2} + 2k\pi$
292	$\tan 2x - 3 \tan x = 0$	$k\pi; \pm \frac{\pi}{6} + k\pi$
293	$\sin x - \tan \frac{x}{2} - \cos x = 0$	$\pm \frac{\pi}{2} + 2k\pi$
294	$\tan 2x - 2\sqrt{3} \cos 2x = 0$	$\frac{\pi}{6} + k\pi; \frac{\pi}{3} + k\pi$
295	$2 \sin x + \tan x - 1 = 2 \cos x$	$\pm \frac{2}{3}\pi + 2k\pi; \frac{\pi}{4} + k\pi$
296	$2 \sin \left(\frac{\pi}{3} + x \right) - \sqrt{3} \cos x + 1 = 0$	$\frac{3}{2}\pi + 2k\pi$
297	$\sin 2x = 2 \cos x$	$\frac{\pi}{2} + k\pi$
298	$\cos 8x + \cos 4x = 2 \cos 6x$	$k\pi; \frac{\pi}{12} + k \frac{\pi}{6}$
299	$\sin \left(x + \frac{\pi}{6} \right) - \sin \left(x - \frac{\pi}{6} \right) = \sqrt{3} \sin \frac{\pi}{6}$	$\pm \frac{\pi}{6} + 2k\pi$
300	$\cos \left(\frac{\pi}{4} - x \right) + \cos \left(\frac{\pi}{4} + x \right) - \frac{\sqrt{6}}{2} = 0$	$\pm \frac{\pi}{6} + 2k\pi$
301	$3 \sin x \cos x - \sqrt{3} \cos^2 x - 3 \sin x + \sqrt{3} \cos x = 0$	$2k\pi; \frac{\pi}{6} + k\pi$
302	$\tan 3x - \tan x = \sec x \cdot \sin 2x$	$k\pi; \pm \frac{2}{3}\pi + 2k\pi$

303	$4 \cos^2 x + 5 \cos x - 2 = 0$	$\pm \arccos \left(\frac{-5 + \sqrt{57}}{8} \right) + 2k\pi$
304	$3 \tan^2 x - 4 \tan x + 3 = 0$	<i>impossibile</i>
305	$5 \sin^2 x + \sqrt{3} \sin x \cos x - 2 = 0$	$\arctan \left(-\frac{2\sqrt{3}}{3} \right) + k\pi; \frac{1}{6}\pi + k\pi$
306	$\sqrt{2} \sin 2x + \sin^2 x + 1 = 0$	$\arctan(\sqrt{2} - \sqrt{3}) + 2k\pi;$ $\arctan(\sqrt{2} + \sqrt{3}) + 2k\pi$
307	$2 \sin 2x + \sqrt{5} \sin x = 0$	$k\pi; \pm \arccos \left(-\frac{\sqrt{5}}{4} \right) + 2k\pi$
308	$\sin x + \sqrt{5} \cos x - 3 = 0$	<i>impossibile</i>
309	$\sin x (\tan x - \sqrt{3}) = 0$	$k\pi; \frac{\pi}{3} + k\pi$
310	$3 \cos^2 x + 2 \sin^2 x - \tan^2 x = \frac{3}{2}$	$\pm \frac{\pi}{4} + k\pi$
311	$\tan^2 x + 3 \cot^2 x - 4 = 0$	$\pm \frac{\pi}{3} + k\pi; \pm \frac{\pi}{4} + k\pi$
312	$\sqrt{2} \csc x + 2 = \cot x (\sqrt{2} + 2 \sin x)$	$-\frac{\pi}{4} + 2k\pi; \frac{5}{4}\pi + 2k\pi$
313	$\tan \left(\frac{\pi}{4} - \frac{x}{2} \right) + \sin x = 1$	$2k\pi; \frac{\pi}{2} + 2k\pi$
314	$\frac{\cos x + \cos^2 x}{1 + \cos x} = 1$	$k\pi$

315	$\frac{\sin x}{1 - \cos x} = \sqrt{3}$	$\frac{\pi}{3} + 2k\pi$
316	$2\sin^2 x + 3\cos x = 3$	$2k\pi; \pm \frac{\pi}{3} + 2k\pi$
317	$\sqrt{3} \sin x + 5 \cos x + 1 = 0$	$-2 \arctan\left(\frac{\sqrt{3}}{2}\right) + 2k\pi;$ $\frac{2}{3}\pi + 2k\pi$
318	$7 \cos^2 x + 5 \sin x + 4 = 0$	$\pi - \arcsin\left(\frac{5 - 3\sqrt{37}}{14}\right) + 2k\pi;$ $\left(\frac{5 - 3\sqrt{37}}{14}\right) + 2k\pi$
319	$2 \sin^2 x + 3 \sin x - 1 = 0$	$\pi - \arcsin\left(\frac{-3 + \sqrt{17}}{4}\right) + 2k\pi;$ $\arcsin\left(\frac{-3 + \sqrt{17}}{4}\right) + 2k\pi$
320	$-2 \cos^2 x + 4 \sin x \cos x + 3 \sin^2 x = 0$	$\arctan\left(\frac{-2 - \sqrt{10}}{3}\right) + k\pi;$ $\arctan\left(\frac{-2 + \sqrt{10}}{3}\right) + k\pi$

