

## Scomposizione di polinomi

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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. raccoglimento totale



1	$2a^2 - 4ab$	$2a(a - 2b)$
2	$ab^2 + ab$	$ab(b + 1)$
3	$6ab^3 + 9a^2b$	$3ab(2b^2 + 3a)$
4	$3x^3 - 2x^2$	$x^2(3x - 2)$
5	$15x^2y - 10x^3$	$5x^2(3y - 2x)$
6	$20ax^2 - 15a^2x$	$5ax(4x - 3a)$
7	$50x^2y^3 - 20xy^4$	$10xy^3(5x - 2y)$
8	$121x^4 - 132x^6$	$11x^4(11 - 12x^2)$
9	$3x^3y^3 - 15x^3$	$3x^3(y^3 - 5)$
10	$abx^2 + 2ab^2x + a^2bx$	$abx(x + 2b + a)$
11	$4a^2x^2 - 6a^3x + 8a^2x^3$	$2a^2x(2x - 3a + 4x^2)$
12	$x^4y^2 + x^6y^4 - x^3y^3$	$x^3y^2(x + x^3y^2 - y)$
13	$15a^{10} - 20a^8 + 25a^6$	$5a^6(3a^4 - 4a^2 + 5)$

14	$8a^4t^3 - 12at^4 - 4a^3t^2$	$4at^2(2a^3t - 3t^2 - a^2)$
15	$12x^2y^3 - 24x^3y^2 + 9x^2y^2$	$3x^2y^2(4y - 8x + 3)$
16	$\frac{1}{3}b^4 - \frac{1}{6}b^2 + \frac{1}{9}b^6$	$\frac{1}{3}b^2\left(b^2 - \frac{1}{2} + \frac{1}{3}b^4\right)$
17	$\frac{27}{4}x^3 - \frac{9}{20}x^4 + \frac{3}{16}x^2$	$\frac{3}{4}x^2\left(9x - \frac{3}{5}x^2 + \frac{1}{4}\right)$
18	$\frac{20}{9}ab - \frac{4}{9}a^2b + \frac{5}{3}ab^2$	$\frac{1}{3}ab\left(\frac{20}{3} - \frac{4}{3}a + 5b\right)$
19	$\frac{1}{9}yz + \frac{1}{3}y^2 + \frac{2}{3}y$	$\frac{1}{3}y\left(\frac{1}{3}z + y + \frac{2}{3}\right)$
20	$\frac{3}{4}abx - \frac{9}{2}a^2b^2x^2 - \frac{15}{14}a^3bx^2$	$\frac{3}{2}abx\left(\frac{1}{2} - 3abx - \frac{5}{7}ax\right)$
21	$a(a - 1) + 2b(a - 1)$	$(a - 1)(a + 2b)$
22	$(x - y)^2 - 7(x - y) - xy(x - y)$	$(x - y)(x - y - 7 - xy)$
23	$a(a - x)^2 + 2(a - x) + x(a - x)(a - 2)$	$(a - x)(a^2 - 2x + 2)$
24	$x^2(x + 1) + x^3(x + 1) - 2x - 2$	$(x + 1)(x^2 + x^3 - 2)$

25	$b^2(3x - y) - b(3x - y)^2 - 3(3x - y)$	$(3x - y)[b^2 - b(3x - y) - 3]$
26	$(x - y)^2 + 2(x - y) - xy(x - y)$	$(x - y)(x - y + 2 - xy)$

## 2. raccoglimento parziale



27	$a^2 + ab + ad + bd$	$(a + b)(a + d)$
28	$ab + by + 3a + 3y$	$(a + y)(x + 3)$
29	$x^2 + xy + 3x + 3y$	$(x + y)(x + 3)$
30	$bx - by + xy - x^2$	$(x - y)(b - x)$
31	$x^2y + y - x^2 - 1$	$(x^2 + 1)(y - 1)$
32	$10a^2 - 5ab + 2ay - by$	$(2a - b)(5a + y)$
33	$mn^2 - mx^3 + n^2 - x^3$	$(n^2 - x^3)(m + 1)$
34	$ab^2 - ay^3 - b^2 + y^3$	$(b^2 - y^3)(a - 1)$
35	$ax - 2x + ay - 2y + 2az - 4z$	$(a - 2)(x + y + 2z)$
36	$ay - 2by + a^2 - 2ab$	$(a - 2b)(a + y)$
37	$4a^2 - 2a + 6ab - 3b$	$(2a - 1)(2a + 3b)$

38	$2x^2 - 3ax + xy - 2bx + 3ab - by$	$(x - b)(2x - 3a + y)$
39	$4x^2 + 3x + 4xy + 3y$	$(4x + 3)(x + y)$
40	$5a^2 - 7ab + 5a^2x - 7abx$	$a(5a - 7b)(x + 1)$
41	$nx + ny + 2my + 2m + n + 2mx$	$(n + 2m)(x + y + 1)$
42	$2x(x - y)^2 - 4xy + 4y^2$	$2(x - y)[x(x - y) - 2y]$
43	$(a - 1)y + 1 - a$	$(a - 1)(y - 1)$
44	$(a + b)^2(a - b) - 4ax - 4bx + ab^2 + b^3$	$(a + b)(a^2 - 4x)$

3. differenza di quadrati:  $a^2 - b^2 = (a + b)(a - b)$



45	$x^2 - 1$	$(x - 1)(x + 1)$
46	$x^2 - 25$	$(x - 5)(x + 5)$
47	$1 - y^2$	$(1 - y)(1 + y)$
48	$4x^2 - 49$	$(2x - 7)(2x + 7)$
49	$x^2y^2 - 9$	$(xy - 3)(xy + 3)$
50	$x^2 - 16$	$(x + 4)(x - 4)$

51	$4 - 9a^4$	$(2 + 3a^2)(2 - 3a^2)$
52	$x^6y^2 - 1$	$(x^3y + 1)(x^3y - 1)$
53	$a^4 - 4$	$(a^2 - 2)(a^2 + 2)$
54	$x^4 - 1$	$(x^2 + 1)(x + 1)(x - 1)$
55	$25a^6 - 4b^2$	$(5a^3 - 2b)(5a^3 + 2b)$
56	$b^2 - 25c^4$	$(b - 5c^2)(b + 5c^2)$
57	$a^4 - b^2$	$(a^2 - b)(a^2 + b)$
58	$x^{10} - b^6$	$(x^5 - b^3)(x^5 + b^3)$
59	$121e^2 - 289i^2$	$(11e - 17i)(11e + 17i)$
60	$\frac{9}{4}y^2 - \frac{49}{81}z^2$	$\left(\frac{3}{2}y - \frac{7}{9}z\right)\left(\frac{3}{2}y + \frac{7}{9}z\right)$
61	$\frac{1}{4} - x^2$	$\left(\frac{1}{2} + x\right)\left(\frac{1}{2} - x\right)$


62	$\frac{1}{49}c^6 - 4x^4$	$\left(\frac{1}{7}c^3 - 2x^2\right)\left(\frac{1}{7}c^3 + 2x^2\right)$
63	$\frac{1}{9}a^8 - \frac{1}{25}$	$\left(\frac{1}{3}a^4 - \frac{1}{5}\right)\left(\frac{1}{3}a^4 + \frac{1}{5}\right)$
64	$\frac{1}{25}a^{10} - \frac{1}{4}b^4$	$\left(\frac{1}{5}a^5 - \frac{1}{2}b^2\right)\left(\frac{1}{5}a^5 + \frac{1}{2}b^2\right)$
65	$\frac{9}{4}x^2 - \frac{1}{9}y^2$	$\left(\frac{3}{2}x - \frac{1}{3}y\right)\left(\frac{3}{2}x + \frac{1}{3}y\right)$
66	$\frac{4n^2}{y^2} - \frac{z^2}{81}$	$\left(\frac{2n}{y} - \frac{z}{9}\right)\left(\frac{2n}{y} + \frac{z}{9}\right)$
67	$(a - 1)^2 - b^2$	$(a - 1 - b)(a - 1 + b)$
68	$(a + b)^2 - (x - y)^2$	$(a + b - x + y)(a + b + x - y)$
69	$a^6 - 4(b - 2)^2$	$(a^3 - 2b + 4)(a^3 + 2b - 4)$
70	$(c - 3)^2 - 9b^2$	$(c - 3 - 3b)(c - 3 + 3b)$
71	$(xy - 1)^2 - 4$	$(xy - 3)(xy + 1)$
72	$(a - b)^2 - (x + y)^2$	$(a - b - x - y)(a - b + x + y)$

4. quadrato di binomio  $(a^2 \pm 2ab + b^2) = (a \pm b)^2$ 

73	$x^2 + 4x + 4$	$(x + 2)^2$
74	$x^2 - 16x + 64$	$(x - 8)^2$
75	$25x^2 + 10x + 1$	$(5x + 1)^2$
76	$4y^2 + 12y + 9$	$(2y + 3)^2$
77	$x^2 + 2xy^2 + y^4$	$(x + y^2)^2$
78	$x^4 - 2x^2y + y^2$	$(x^2 - y)^2$
79	$x^2 + 9 + 6x$	$(x + 3)^2$
80	$4a^2 + 9 - 12a$	$(2a - 3)^2$
81	$9a^2 - 6ax + x^2$	$(3a - x)^2$
82	$4a^2x^2 + 4ax + 1$	$(2ax + 1)^2$



83	$x^2y^2 - 10xyz^2 + 25z^4$	$(xy - 5z^2)^2$
84	$1 + 9a^2 + 6a$	$(1 + 3a)^2$
85	$x^2 + x + \frac{1}{4}$	$\left(x + \frac{1}{2}\right)^2$
86	$\frac{1}{49}a^2 - \frac{2}{7}a + 1$	$\left(\frac{1}{7}a - 1\right)^2$
87	$\frac{1}{9}b^2 - \frac{4}{3}b + 4$	$\left(\frac{1}{3}b - 2\right)^2$
88	$\frac{9}{4}a^2 + 4b^2 + 6ab$	$\left(\frac{3}{2}a + 2b\right)^2$
89	$\frac{1}{16}x^2 + 4y^2 + xy$	$\left(\frac{1}{4}x + 2y\right)^2$
90	$\frac{9}{4}a^2 + b^6 - 3ab^3$	$\left(\frac{3}{2}a - b^3\right)^2$
91	$\frac{81}{25}x^4 + \frac{25}{4} - 9x^2$	$\left(\frac{9}{5}x^2 - \frac{5}{2}\right)^2$
92	$25a^4b^2 - 10a^2bc^2 + c^4$	$(5a^2b - c^2)^2$

93	$16a^2b^2 + 40abc + 25c^2$	$(4ab + 5c)^2$
94	$\frac{1}{4}x^2 + \frac{1}{3}xy + \frac{1}{9}y^2$	$\left(\frac{1}{2}x + \frac{1}{3}y\right)^2$
95	$\frac{x^2}{4} - \frac{xy}{3} + \frac{y^2}{9}$	$\left(\frac{x}{2} - \frac{y}{3}\right)^2$
96	$(a - 1)^2 - 2(a - 1) + 1$	$(a - 2)^2$
97	$(a + b)^2 + 2(a + b)(x + y) + (x + y)^2$	$(a + b + x + y)^2$
98	$(x + 2b)^2 - 2(x + 2b)(a + b) + (a + b)^2$	$(x + b - a)^2$
99	$1 - 2(x - 3y) + (x - 3y)^2$	$(1 - x + 3y)^2$
100	$-(x + 1)^2 - 2c(x + 1) - c^2$	$-(x + 1 + c)^2$
101	$1 + 4(x - 2) + 4(x - 2)^2$	$(2x - 3)^2$
<b>5. quadrato di trinomio</b> 		
102	$x^2 + y^2z^2 + 4 - 2xyz + 4x - 4yz$	$(x - yz + 2)^2$


103	$4x^2 + yz^4 + 1 - 4xyz^2 + 4x - 2yz^2$	$(2x - yz^2 + 1)^2$
104	$a^6 + b^4 + 4c^2 + 2a^3b^2 - 4a^3c - 4b^2c$	$(a^3 + b^2 - 2c)^2$
105	$a^8 + a^4b^4 - 10a^4 - 2a^6b^2 + 25 + 10a^2b^2$	$(5 - a^4 + a^2b^2)^2$
106	$a^2 + x^2 + 81 + 2ax + 18a + 18x$	$(a + x + 9)^2$
107	$a^2 + b^2 + 16 - 2ab - 8a + 8b$	$(a - b - 4)^2 = (b + 4 - a)^2$
108	$x^2 + 4y^2 + 9z^2 - 4xy + 6xz - 12yz$	$(x - 2y + 3z)^2 = (-x + 2y - 3z)^2$
109	$x^4 + 9y^2 + 4x^2 + 6x^2y + 4x^3 + 12xy$	$(x^2 + 3y + 2x)^2$
110	$9n^2 + 16m^2 + 4t^2 + 24nm - 12nt - 16mt$	$(3n + 4m - 2t)^2$
111	$9 + 3x - 6z^3 + \frac{x^2}{4} + z^6 - xz^3$	$\left(3 + \frac{x}{2} - z^3\right)^2$
112	$x^2 + 2xz^3 - 3x - 3z^3 + \frac{9}{4} + z^6$	$\left(\frac{3}{2} - x - z^3\right)^2$

113	$\frac{1}{x^2} + \frac{2}{xy} + \frac{1}{y^2} + \frac{2}{yz} + \frac{1}{z^2} + \frac{2}{xz}$	$\left(\frac{1}{x} + \frac{1}{y} + \frac{1}{z}\right)^2$
114	$\frac{9}{16}x^2 + 3xy - \frac{3}{2}x^2y + 4y^2 - 4xy^2 + x^2y^2$	$\left(\frac{3}{4}x - xy + 2y\right)^2 = \left(-\frac{3}{4}x + xy - 2y\right)^2$
115	$a^2b^2 + \frac{49}{4}a^4 - 7a^3b - 9ab^3 + \frac{81}{4}b^4 + \frac{63}{2}a^2b^2$	$\left(ab - \frac{7}{2}a^2 - \frac{9}{2}b^2\right)^2$

## 6. cubo di binomio



116	$27 + 27a^3 + 9a^6 + a^9$	$(3 + a^3)^3$
117	$a^3 + 12a^2 + 48a - 64$	$(a - 4)^3$
118	$1 - x^6 - 3x^2 + 3x^4$	$(1 - x^2)^3$
119	$27x^3 - 54x^2 + 36x - 8$	$(3x - 2)^3$
120	$8a^3 + 36a^2 + 54a + 27$	$(2a + 3)^3$
121	$64b^6 - 48b^4 + 12b^2 - 1$	$(4b^2 - 1)^3$
122	$27x^3 - 27x^2y + 9xy^2 - y^3$	$(3x - y)^3$
123	$a^3 + 6a^2x + 12ax^2 + 8x^3$	$(a + 2x)^3$

124	$a^6b^3 - 6a^4b^2 + 12a^2b - 8$	$(a^2b - 2)^3$
125	$\frac{8}{27}b^3 - \frac{4}{3}b^2x^2 + 2bx^4 - x^6$	$\left(\frac{2}{3}b - x^2\right)^3$
126	$\frac{8}{27}a^3 - \frac{2}{3}a^2b^3 + \frac{1}{2}ab^6 - \frac{1}{8}b^9$	$\left(\frac{2}{3}a - \frac{1}{2}b\right)^3$
127	$\frac{a^9}{27} + \frac{a^6b^2}{6} + \frac{a^3b^4}{4} + \frac{b^6}{8}$	$\left(\frac{a^3}{3} - \frac{b^2}{2}\right)^3$
128	$125a^9 + 150a^6b + 60a^3b^2 + 8b^3$	$(5a^3 + 2b)^3$
129	$27v^3 - 54v^2t + 36vt^2 - 8t^3$	$(3v - 2t)^3$
130	$\frac{1}{27}x^6 + \frac{1}{3}x^4y + x^2y^2 + y^3$	$\left(\frac{1}{3}x^2 + y\right)^3$
131	$\frac{1}{n^3} + \frac{3m}{n^2} + \frac{3m^2}{n} + m^3$	$\left(\frac{1}{n} + m\right)^3$
<b>7. riduzione a differenza di quadrati</b> 		
132	$4 - 4b + b^2 - a^4$	$(a^2 - b + 2)(2 - b - a^2)$

133	$x^2 + y^2 - 2xy - y^4$	$(x - y + y^2)(x - y - y^2)$
134	$4a^2 - b^2 - c^2 + 2bc$	$(2a + b - c)(2a - b + c)$
135	$c^6 - 6x^2 - x^4 - 9$	$(c^3 + x^2 + 3)(c^3 - 3 - x^2)$
136	$c^4 - a^4 + 2a^2b^2 - b^4$	$(a^2 - b^2 + c^2)(c^2 + b^2 - a^2)$
137	$9x^2 - 16 + 8y - y^2$	$(4 - y + 3x)(y - 4 + 3x)$
138	$a^2 + 9 + 6a - (2x - y)^2$	$(a + 3 - 2x + y)(a + 3 + 2x - y)$
139	$a^2 + b^2 - c^2 + 2ab$	$(a + b - c)(a + b + c)$
140	$a^2 - 4b^2 - 9 + 12b$	$(a + 2b - 3)(a - 2b + 3)$
141	$a^6 - 4y^2 - 1 - 4y$	$(a^3 - 2y - 1)(a^3 + 2y + 1)$
142	$\frac{1}{16} - \frac{1}{2}b^3 + b^6 - c^4$	$\left(\frac{1}{4} - c^2 - b^3\right)\left(\frac{1}{4} + c^2 - b^3\right)$
143	$\frac{1}{4} - a + a^2 - \frac{1}{9}c^2 - \frac{2}{3}bc - b^2$	$\left(\frac{1}{2} - a - \frac{c}{3} - b\right)\left(\frac{1}{2} - a + \frac{c}{3} + b\right)$

8. somma e differenza di cubi  $a^3 \pm b^3 = (a \pm b)(a^2 \mp ab + b^2)$ 

144	$a^3 - 1$	$(a - 1)(a^2 + a + 1)$
145	$a^3 + 1$	$(a + 1)(a^2 - a + 1)$
146	$x^3 - 8$	$(x - 2)(x^2 + 2x + 4)$
147	$a^3 - b^3$	$(a - b)(a^2 + ab + b^2)$
148	$x^3 + y^3$	$(x + y)(x^2 - xy + y^2)$
149	$x^9 - 8$	$(x^3 - 2)(x^6 + 2x^3 + 4)$
150	$a^6 - 1$	$(a^2 - 1)(a^4 + a^2 + 1)$
151	$x^6y^3 - 27$	$(x^2y - 3)(x^4y^2 + 3x^2y + 9)$
152	$a^6 + b^9$	$(a^2 + b^3)(a^4 - a^2b^3 + b^6)$
153	$a^6 + 27b^3$	$(a^2 + 3b)(a^4 - 3a^2b + 9b^2)$

154	$125 - y^3$	$(5 - y)(25 + 5y + y^2)$
155	$8 + a^9$	$(2 + a^3)(4 - 2a^3 + a^6)$
156	$27a^3 - \frac{1}{27}b^3$	$\left(3a - \frac{1}{3}b\right)\left(9a^2 + ab + \frac{1}{9}b^2\right)$
157	$x^3y^3 + \frac{1}{8}z^3$	$\left(xy + \frac{1}{2}z\right)\left(x^2y^2 - \frac{1}{2}xyz + \frac{1}{4}z^2\right)$
158	$64a^3b^3 - 125c^3$	$(4ab - 5c)(16a^2b^2 + 20ab + 25c^2)$
159	$1000u^3 + 729k^3$	$(10u + 9k)(100u^2 - 90uk + 81k^2)$

## 9. trinomio di secondo grado



160	$a^2 + a - 2$	$(a - 1)(a + 2)$
161	$x^2 - x - 2$	$(x + 1)(x - 2)$
162	$a^2 - 5a + 6$	$(a - 2)(a - 3)$
163	$x^2 + x - 6$	$(x - 2)(x + 3)$
164	$b^2 - 5b - 6$	$(b + 1)(b - 6)$



165	$y^2 - y - 6$	$(y + 2)(y - 3)$
166	$z^2 + 5z - 6$	$(z - 1)(z + 6)$
167	$b^2 - 22b + 40$	$(b - 20)(b - 2)$
168	$a^2 - 18a - 40$	$(a - 20)(a + 2)$
169	$x^2 - 2x - 15$	$(x - 5)(x + 3)$
170	$2a^2 + 7a + 3$	$(2a + 1)(a + 3)$
171	$3a^2 + a - 10$	$(3a - 5)(a + 2)$
172	$2t^2 + t - 3$	$(t - 1)(2t + 3)$
173	$3a^2 - 7a - 6$	$(a - 3)(3a + 2)$
174	$6a^2 - 3a - 18$	$(2a + 3)(3a - 6)$
175	$a^2 - 3ab + 2b^2$	$(a - b)(a - 2b)$
176	$x^2 + 3xy + 2y^2$	$(x + y)(x + 2y)$

177	$a^2 + 5ab + 6b^2$	$(a + 2b)(a + 3b)$
178	$a^2 - 5ax + 6x^2$	$(a - 2x)(a - 3x)$
179	$x^2 + 18ax - 40a^2$	$(x + 20a)(x - 2a)$
180	$x^2 + 22xy + 40y^2$	$(x + 20y)(x + 2y)$
181	$5x^2 - 2xy - 16y^2$	$(5x + 8y)(x - 2y)$
182	$4a^2 - 11ab + 7b^2$	$(a - b)(4a - 7b)$
183	$x^4 + 4x^2 - 45$	$(x^2 - 5)(x^2 + 9)$
184	$v^2 - 2vt - 15t^2$	$(v - 5t)(v + 3t)$
185	$3x^2 + 12x + 13$	non scomponibile
186	$x^2 - \frac{7}{12}xy - y^2$	$\left(\frac{1}{4}x - \frac{1}{3}y\right)(4x + 3y)$

## 10. regola di Ruffini



187	$2y^4 + 5y^3 - 5y^2 - 5y + 3$	$(y - 1)(y + 1)(2y - 1)(y + 3)$
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188	$x^3 - 5x^2 - 4x + 20$	$(x - 5)(x - 2)(x + 2)$
189	$3a^3 + 2a^2 - 4a - 3$	$(a + 1)(3a^2 - a - 3)$
190	$4b^4 - 3b^2 + 5b - 6$	$(b - 1)(4b^3 + 4b^2 + b + 6)$
191	$x^4 - 2x^3 - 10x^2 + 4x + 16$	$(x + 2)(x^2 - 2)(x - 4)$
192	$a^4 + 5a^3 + 5a^2 - 5a - 6$	$(a - 1)(a + 1)(a + 2)(a + 3)$
193	$y^3 - 4y^2 + y + 6$	$(y + 1)(y - 2)(y - 3)$
194	$3x^3 - 8x^2 + 8x - 3$	$(x - 1)(3x^2 - 5x + 3)$
195	$a^4 - 7a^3 + 4a^2 + 5a - 2$	non scomponibile
196	$3y^3 - 6y^2 + y - 2$	$(3y^2 + 1)(y - 2)$
197	$2x^3 + 3x^2 - 3x - 2$	$(2x + 1)(x - 1)(x + 2)$
198	$3x^3 + 8x^2y + 9xy^2 + 10y^3$	$(x + 2y)(3x^2 + 2xy + 5y^2)$
199	$4a^4 + 2a^3b - 40a^2b^2 + 58ab^3 - 24b^4$	$2(a - b)^2(2a - 3b)(a + 4b)$

## 11. esercizi di riepilogo



200	$a^6b^8 - 81$	$(a^3b^4 - 9)(a^3b^4 + 9)$
201	$x^2 + 6a - 2ax - 9$	$(x - 3)(x + 3 - 2a)$
202	$\frac{m^3}{8} + n^9$	$\left(\frac{m}{2} + n^3\right)\left(\frac{m^2}{4} - \frac{1}{2}mn^3 + n^6\right)$
203	$6a^4 + 5a^2b^2 - 6b^4$	$(3a^2 - 2b^2)(2a^2 + 3b^2)$
204	$a^2b^2 + x^2y^2 + 2abxy$	$(ab + xy)^2$
205	$(2x - 3)^3 - x(2x - 3)^2 + 3(2x - 3)^2$	$x(2x - 3)^2$
206	$2a^4 - 7a^3 + 15 - 17a^2 + 7a$	$(a - 1)(a + 1)(2a + 3)(a - 5)$
207	$x^{16} - 1$	$(x^8 + 1)(x^4 + 1)(x^2 + 1)(x + 1)(x - 1)$
208	$3xy + x^2y - 7xy^2$	$xy(3 + x - 7y)$
209	$2x^2 - 3x - 2$	$(2x + 1)(x - 2)$

210	$m^6 - n^6$	$(m - n)(m + n)(m^2 - mn + n^2)(m^2 + mn + n^2)$
211	$25 - \frac{x^2}{9}$	$(5 - \frac{x}{3})(5 + \frac{x}{3})$
212	$2a^3b^3 - a^4 - a^2b^6$	$-a^2(a - b^3)^2$
213	$x^{10} + x^9 + x^8 + x^7$	$x^7(x + 1)(x^2 + 1)$
214	$m^2 - (n + bm)^2$	$(m - n - bm)(m + n + bm)$
215	$a^3 + 32a + 15a^2 - 48$	$(a - 1)(a + 4)(a + 12)$
216	$(x + y)^3 + 1$	$(x + y + 1)[(x + y)^2 - (x + y) + 1]$
217	$12x^3 + 4xy - 6x^2 - 2y$	$2(2x - 1)(3x^2 + y)$
218	$25x^4 - 30x^2y + 9y^2$	$(5x^2 - 3y)^2$
219	$9a^3 + 18a^2 - a - 2$	$(a + 2)(3a + 1)(3a - 1)$
220	$b^3 - a^6$	$(b - a^2)(b^2 + a^2b + a^4)$
221	$2x^2 + xy - y^2$	$(2x - y)(x + y)$

222	$-a^2 + 2a - 1$	$-(a - 1)^2$
223	$m^4 + 17m^2 + 10m + 16 + 10m^3$	$(m + 2)(m + 8)(m^2 + 1)$
224	$a^2 + 3ab - 10b^2$	$(a - 2b)(a + 5b)$

## 12. esercizi di riepilogo più impegnativi



225	$a^2 - 1 + a^2x - x$	$(a - 1)(a + 1)(1 + x)$
226	$4a^2b^2 - (a^2 + b^2 - 4)^2$	$(2 - a + b)(2 + a - b)(-2 + a + b)(2 + a + b)$
227	$a^2 - 4 + 3a(a - 2)$	$2(a - 2)(2a + 1)$
228	$2x^4 - 32$	$2(x^2 + 4)(x - 2)(x + 2)$
229	$a^3 - 8 + 5(a^2 + 2a + 4)$	$(a^2 + 2a + 4)(a + 3)$
230	$(x + 2y)^2 - 4y(x + 2y) + 4y^2$	$x^2$
231	$16 - x^2 + 2xy - y^2$	$(4 - x + y)(4 + x - y)$
232	$(x - 3)^2 - 4(x - 3)$	$(x - 3)(x - 7)$
233	$4a^2b^2 - (ab - a^2)^2$	$a^2(a + b)(3b - a)$
234	$x^3 + 9y^2 + x^2 + 9xy^2$	$(x + 1)(x^2 + 9y^2)$

235	$3x^6 - 192$	$3(x-2)(x^2+2x+4)(x+2)(x^2-2x+4)$
236	$x^3 - 6x^2 - x + 30$	$(x-5)(x-3)(x+2)$
237	$ax^3 - 3bx^3 + 3b - a$	$(a-3b)(x-1)(x^2+x+1)$
238	$(2x-1)^2 - 9x^2$	$-(x+1)(5x-1)$
239	$a^2 + b^2 + 2ab - ax - bx$	$(a+b-x)(a+b)$
240	$5a^6 + 5a$	$5a(a+1)(a^4 - a^3 + a^2 - a + 1)$
241	$4z^3 - 7y^2z + 3y^3$	$(z-y)(2z+3y)(2z-y)$
242	$x^6 - y^6 + 2x^2 - 2y^2$	$(x+y)(x-y)(x^4 + x^2y^2 + y^4 + 2)$
243	$3x^4 + 6x^3 + 9x^2 + 18x$	$3x(x+2)(x^2+3)$
244	$(a+4b)^2 + 2(a+4b)(a-b) + (a-b)^2$	$(2a+3b)^2$
245	$2x^5 - 32$	$2(x^5 - 16)$
246	$y^3 - 3xy^2 + 5x^2y - 3x^3$	$(y-x)(y^2 - 2xy + 3x^2)$
247	$x^6 + 2x^3 + 1$	$(x+1)^2(x^2-x+1)^2$
248	$x^5 - 6x^4 + 12x^3 - 8x^2$	$x^2(x-2)^3$

249	$x^6 - y^6 + x^3 - y^3$	$(x - y)(x^2 + xy + y^2)(x^3 + y^3 + 1)$
250	$3x(4 - x^2) - 2x + x^2$	$x(2 - x)(3x + 5)$
251	$4(a - 5b)^2 - a^2$	$(a - 10b)(3a - 10b)$
252	$a^2 - 4a + 4 + ab - 2b$	$(a - 2)(a - 2 + b)$
253	$x^2 - y^2 + ax^2 - 2axy + ay^2$	$(x - y)(x + y + ax - ay)$
254	$256 - (x - y)^4$	$(4 - x + y)(4 + x - y)[16 + (x - y)^2]$
255	$(x + 2y - 1)^2 - 1$	$(x + 2y - 2)(x + 2y)$
256	$x^4 - y^4 + 3ax^2 - 3ay^2$	$(x + y)(x - y)(x^2 + y^2 + 3a)$
257	$a(a - 2b)(a - b) - 2b(a + 2b)(a - b)$	$(a - b)(a^2 - 4ab - 4b^2)$
258	$a^6 + 16a^3 + 64$	$(a + 2)^2(a^2 - 2a + 4)^2$
259	$a^2 + 4a - 21 + ax - 3x$	$(a - 3)(a + 7 + x)$



260	$x^5 - x - 2x^4 + 2$	$(x^2 + 1)(x + 1)(x - 1)(x - 2)$
261	$(a^2 - 9)^2 + a^2 - 6a + 9$	$(a - 3)^2[(a + 3)^2 + 1]$
262	$x^3 + 3x^2 - 6x - 8$	$(x + 1)(x - 2)(x + 4)$
263	$x^3 - 3x^2 + 3x - 1 + xy - y$	$(x - 1)[(x - 1)^2 + y]$
264	$27x^4 - \frac{xy^3}{8}$	$x\left(3x - \frac{y}{2}\right)\left(9x^2 + \frac{3}{2}xy + \frac{y^2}{4}\right)$
265	$2x^6 - 10x^4y^2 + 8x^2y^4$	$2x^2(x - y)(x - 2y)(x + y)(x + 2y)$