

טכניקות אלגבריות
פתרון משוואות ומערכותיהן.

מגמה : הנדסאי תוכנה

פרוק לגורמים.

ע"י הוצאת גורם משותף.

תשובות

הוצא גורם משותף:

$$3x(y - 5m + 6a)$$

$$3xy - 15xm + 18xa \quad (1)$$

$$2x^3(m - 4c + 6)$$

$$2x^3m - 8x^3c + 12x^3 \quad (2)$$

$$4x^2(2x^3 - 3x^2 + 5x - 7)$$

$$8x^5 - 12x^4 + 20x^3 - 28x^2 \quad (3)$$

$$3m^2(3b - 2c + 6m - 7m^2x)$$

$$9m^2b - 6m^2c + 18m^3 - 21m^4x \quad (4)$$

$$8a^2b^3(3 + 5a - a^2)$$

$$24a^2b^3 + 40a^3b^3 - 8a^4b^3 \quad (5)$$

$$5a^2b^2(8a^3b^3 - 12bc^2 + 5ac)$$

$$40a^5b^5 - 60a^2b^3c^2 + 25a^3b^2c \quad (6)$$

$$7a^4c^4(5a^2c - 2x^2 + 3a^6y)$$

$$35a^6c^5 - 14c^4a^4x^2 + 21c^4a^{10}y \quad (7)$$

$$(x + a)(c^3 - 5)$$

$$c^3(x + a) - (x + a)5 \quad (8)$$

$$(x^2 - 5x)(m - a + c^2)$$

$$m(x^2 - 5x) - a(x^2 - 5x) + (x^2 - 5x) \cdot c^2 \quad (9)$$

$$(a + 3c)(3a^2 - 4m)$$

$$3a^2(a + 3c) - 4m \cdot (3c + a) \quad (10)$$

$$(2a^2 - 3c)(10x - a^2 - 6m^3)$$

$$10x(2a^2 - 3c) + a^2(3c - 2a^2) - 6m^3(2a^2 - 3c) \quad (11)$$

פירוק לפי קבוצות.

$$(3a + 4b)(2x + 5y)$$

$$6ax + 8bx + 15ay + 20by \quad (12)$$

$$(5a - 3b)(7x + 2m)$$

$$35ax + 10am - 21bx - 6bm \quad (13)$$

$$(2a - c)(3a - 2b)$$

$$6a^2 - 4ab - 3ac + 2bc \quad (14)$$

$$(2a - 3b)(3x - y + 2)$$

$$6ax - 9xb - 2ay + 3by + 4a - 6b \quad (15)$$

$$(5a - 4b)(2m - 3n + 1)$$

$$10am - 8mb - 15an + 12nb - 4b + 5a \quad (16)$$

פירוק לגורמים ע"י שימוש בנוסחה

$$\underline{a^2 - b^2 = (a + b)(a - b)}$$

פרק לגורמים (אם יש צורך, הוצא קודם גורם משותף):

$$(5x - 3)(5x + 3)$$

$$25x^2 - 9 \quad (17)$$

לא ניתן

$$3 + 75x^2 \quad (18)$$

$$(10a - 7m)(10a + 7m)$$

$$100a^2 - 49m^2 \quad (19)$$

$$(6ab - 5x^3)(6ab + 5x^3)$$

$$36a^2b^2 - 25x^6 \quad (20)$$

$$(8x - 3m^2)(8x + 3m^2)$$

$$64x^2 - 9m^4 \quad (21)$$

לא ניתן

$$64 - xy^2 \quad (22)$$

$$(11x^3a - 9m^2)(11x^3a + 9m^2)$$

$$121x^6a^2 - 81m^4 \quad (23)$$

$$3(a - 2)(a + 2)$$

$$3a^2 - 12 \quad (24)$$

$$2(5 - m)(5 + m)$$

$$50 - 2m^2 \quad (25)$$

$$a(a - 1)(a + 1)$$

$$a^3 - a \quad (26)$$

$$y(1 - 10x)(1 + 10x)$$

$$y - 100x^2y \quad (27)$$

$$5a(a - 3)(a + 3)$$

$$5a^3 - 45a \quad (28)$$

$$7m^3x(m - 2)(m + 2)$$

$$7m^5x - 28m^3x \quad (29)$$

$$m(m - 3)(m + 3)(m^2 + 9)$$

$$m^5 - 81m \quad (30)$$

$$3a^2(x - 2m)(x + 2m)$$

$$3a^2x^2 - 12m^2a^2 \quad (31)$$

$$7a^3m(1 - a)(1 + a)$$

$$7a^3m - 7a^5m \quad (32)$$

$$(2x - y)(2x + y)(4x^2 + y^2)$$

$$16x^4 - y^4 \quad (33)$$

פירוק לגורמים ע"י שימוש בנוסחאות

$$\underline{a^2 \pm 2ab + b^2 = (a \pm b)^2}$$

הערה: $(a \pm b)^2 = (b \pm a)^2$

תשובות:

פרק את הביטויים הנ"ל:

$(x-10)^2$	$x^2 - 20x + 100$ (34)
$(x+3)^2$	$x^2 + 6x + 9$ (35)
לא ניתן	$-x^2 + 6x + 9$ (36)
לא ניתן	$x^2 - 6x - 9$ (37)
$-(x-7)^2$	$-x^2 + 14x - 49$ (38)
$25(m-b)^2$	$25m^2 - 50mb + 25b^2$ (39)
$(2x+7)^2$	$4x^2 + 28x + 49$ (40)
$(6-5x)^2$	$36 - 60x + 25x^2$ (41)
$-9(x+2)^2$	$-9x^2 - 36x - 36$ (42)
$(8x+7)^2$	$112x + 49 + 64x^2$ (43)
$3(2x+1)^2$	$12x^2 + 12x + 3$ (44)
$(xy-3)^2$	$x^2y^2 - 6xy + 9$ (45)
לא ניתן	$1 - 2x + x^2y^2$ (46)
$(1-11x)^2$	$1 - 22x + 121x^2$ (47)
$(3x-5y)^2$	$9x^2 - 30xy + 25y^2$ (48)
$(2xy+1)^2$	$4x^2y^2 + 4xy + 1$ (49)
$(7x+9y)^2$	$49x^2 + 81y^2 - 126xy$ (50)
$(5a-4b^3)^2$	$25a^2 - 40ab^3 + 16b^6$ (51)
$2a^2(2ab^2-1)^2$	$8a^4b^4 - 8a^3b^2 + 2a^2$ (52)
$-24(2-3x)^2$	$-96 + 288x - 216x^2$ (53)

פירוק לפי טרינום ריבועי.

בתרגילים הבאים :

(א) מצא את שורשי המשוואה הריבועית המתאימה לטרינום : $x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

(ב) פרק את הטרינום הנתון לגורמים לפי התבנית $ax^2 + bx + c = a(x - x_1)(x - x_2)$

• הערה: אם יש צורך, קודם הוצא גורם משותף.

<u>תשובות</u>	<u>תרגילים</u>
$(a - 5)(a - 3)$	$a^2 - 8a + 15$ (54)
$(c + 13)(c + 6)$	$c^2 + 19c + 78$ (55)
$(c - 9)(c + 5)$	$c^2 - 4c - 45$ (56)
$(x - 25)(x + 4)$	$x^2 - 21x - 100$ (57)
$-y - 23 \quad y + 31$	$-y^2 + 8y - 713$ (58)
$(a + 1)(3a + 4)$	$3a^2 + 7a + 4$ (59)
$(a + 2)(2a + 5)$	$2a^2 + 9a + 10$ (60)
$(m - 2)(5m - 3)$	$5m^2 - 13m + 6$ (61)
$(m - 1)(3m - 2)$	$3m^2 - 5m + 2$ (62)
$-y - 2 \quad 5y + 1$	$-5y^2 + 9y + 2$ (63)
$(m - 2)(3m + 1)$	$3m^2 - 5m - 2$ (64)
$(a + 1)(8a - 3)$	$8a^2 + 5a - 3$ (65)
$(x - 1)(10x - 3)$	$10x^2 - 13x + 3$ (66)
$(3x + 4)(3x + 1)$	$9x^2 + 15x + 4$ (67)
$-7x - 2 \quad 3x + 1$	$-21x^2 - x + 2$ (68)
$(5m + 2)(2m - 3)$	$10m^2 - 11m - 6$ (69)
$(2a + 1)(3a - 2)$	$6a^2 - a - 2$ (70)
$-3y - 2 \quad 4y + 5$	$-12y^2 - 7y + 10$ (71)
$a(a - 8)(a - 2)$	$a^3 - 10a^2 + 16a$ (72)
$y(x - 2)(3x + 5)$	$3x^2y - xy - 10y$ (73)
$6x + 5y \quad x + 9y$	$6x^2 + 59xy + 45y^2$ (74)
$9a - 8b \quad a + 3b$	$9a^2 + 19ab - 24b^2$ (75)

פירוק לגורמים משולב.

פרק ככל שניתן:

תשובות

$2x^2(x-2)^2$	$2x^4 - 8x^3 + 8x^2$ (76)
$(3x+1)(2m-1)(m-1)$	$2m^2(3x+1) - 3m(1+3x) + (3x+1)$ (77)
$a(x-3m)(x+2b)$	$ax^2 - 3axm + 2axb - 6abm$ (78)
$(m+t)(x-5)(x+5)$	$x^2m + x^2t - 25m - 25t$ (79)
$b^2(3p-5c)(5-4x)$	$15b^2p - 25b^2c - 12b^2xp + 20b^2xc$ (80)
$(y+b)(x+6)^2$	$x^2y + x^2b + 12xy + 12xb + 36y + 36b$ (81)
$(a-x)(b+4)(b+1)$	$ab^2 + 5ab + 4a - xb^2 - 5bx - 4x$ (82)
$(x-7)(x+7)(a-9)(a+5)$	$x^2a^2 - 4ax^2 - 45x^2 - 49a^2 + 196a + 2205$ (83)

צמצום, כפל וחילוק שברים אלגבריים.

תשובות:

צמצם את השברים הנתונים:

$$\frac{-3a^3m}{b}$$

$$\frac{9a}{5}$$

$$\frac{2a^2}{3b}$$

$$3x^2(m+x)^3$$

$$\frac{-5y^3}{(x-3)^4}$$

$$\frac{-5}{m}$$

$$\frac{b(3p-k)^2}{a}$$

$$\frac{7(2c-3)}{4c^3x}$$

$$3a$$

$$\frac{m-5}{2}$$

$$\frac{a}{3}$$

$$\frac{2a+x}{c-m}$$

$$\frac{-x}{7}$$

$$\frac{4x}{y}$$

$$\frac{24a^6m^5b^3}{-8a^3m^4b^4} \quad (1)$$

$$\frac{9a^2b(k+c)}{5ab(k+c)} \quad (2)$$

$$\frac{14a^3b^5(2c^2+7b^4)}{21ab^6(2c^2+7b^4)} \quad (3)$$

$$\frac{15x^3(m+x)^5}{5x(m+x)^2} \quad (4)$$

$$\frac{-10y^5(x-3)^3}{2y^2(x-3)^7} \quad (5)$$

$$\frac{5m^2(a-2)}{m^3(2-a)} \quad (6)$$

$$\frac{ab^2(k-3p)^5}{a^2b(3p-k)^3} \quad (7)$$

$$\frac{7c^2x(2c-3)^3}{4c^5x^2(3-2c)^2} \quad (8)$$

$$\frac{3ab+6a}{b+2} \quad (9)$$

$$\frac{m^2-5m}{2m} \quad (10)$$

$$\frac{2a^2-3a}{6a-9} \quad (11)$$

$$\frac{2ax+x^2}{cx-mx} \quad (12)$$

$$\frac{x^2-6x}{42-7x} \quad (13)$$

$$\frac{12x^3y^3-8x}{3x^2y^4-2y} \quad (14)$$

$\frac{3a^2}{4}$	$\frac{3a^2b - 6a^3}{4b - 8a}$ (15)
$\frac{a^3}{4a - 1}$	$\frac{4a^4 + a^3}{16a^2 - 1}$ (16)
$-\frac{(5+2a)}{a}$	$\frac{25 - 4a^2}{2a^2 - 5a}$ (17)
$\frac{-3}{m - p}$	$\frac{3p - 3m}{m^2 - 2mp + p^2}$ (18)
$\frac{2a + 3}{2a - 3}$	$\frac{4a^2 + 12a + 9}{4a^2 - 9}$ (19)
$\frac{x(x - y)}{2(x + y)}$	$\frac{x^3 - xy^2}{2x^2 + 4xy + 2y^2}$ (20)
$\frac{x - 4}{x - 5}$	$\frac{x^2 - x - 12}{x^2 - 2x - 15}$ (21)
$\frac{2x - 3}{2(x - 1)}$	$\frac{2x^2 - 5x + 3}{2x^2 - 4x + 2}$ (22)
$\frac{a + 1}{x - 3}$	$\frac{ax - 3 - 3a + x}{x^2 - 6x + 9}$ (23)
$\frac{x + 2}{x - 3}$	$\frac{x^3 + 3x^2 - 4x - 12}{x^3 - 2x^2 - 9x + 18}$ (24)
$\frac{1}{m + 5}$	$\frac{m^4 - 5m^3 - 2m + 10}{m^5 + 50 - 25m^3 - 2m^2}$ (25)

כפל וחילוק שברים אלגבריים.

<u>תשובות:</u>	<u>בצע את הפעולות הנדרשות:</u>
x^3	$\frac{2a + 4b}{3x} \cdot \frac{9x^4a}{6a^2 + 12ab}$ (26)
$\frac{1}{6}$	$\frac{2a + 4}{3a^2 - 3a} \cdot \frac{a^2 - a}{4a + 8}$ (27)
$\frac{a}{b}$	$\frac{a^2 + 3ab}{2b} \cdot \frac{2a - 6b}{a^2 - 9b^2}$ (28)
$\frac{(a - b)(x + 1)}{2}$	$\frac{xa^2 - xb^2}{x^2 - x} \cdot \frac{x^2 - 1}{2a + 2b}$ (29)
$\frac{2a}{3}$	$\frac{a^2 - 5a}{2a - 1} \div \frac{3a - 15}{4a - 2}$ (30)

$$-\frac{4(x-1)}{9} \cdot \frac{x^2-1}{6-3x} \cdot \frac{4x-8}{3x+3} \quad (31)$$

$$\frac{x(a+2)}{3(a-2)} \cdot \frac{a^2+4a+4}{3x^3} \cdot \frac{x^4}{a^2-4} \quad (32)$$

$$\frac{(a+4)(a-2)}{2a} \cdot \frac{a^2-7a+10}{2a-8} \cdot \frac{a^2-16}{a^2-5a} \quad (33)$$

$$\frac{m}{c} \cdot \frac{m^2+5am}{3c} \div \frac{2m^2-50a^2}{6m-30a} \quad (34)$$

$$\frac{(a+2)(2a-3)}{(3a+1)(a-1)} \cdot \frac{a^2-5a-14}{3a^2-14a-5} \cdot \frac{2a^2-13a+15}{a^2-8a+7} \quad (35)$$

$$\frac{a(a+3)}{2} \cdot \frac{a^2-a-12}{2} \div \frac{a^2-16}{a^2+4a} \quad (36)$$

$$\frac{a-5}{a(a+5)} \cdot \frac{a^2-10a+25}{a^2+2a} \div \frac{a^2-25}{a+2} \quad (37)$$

$$\frac{a-5}{(a-2)(a+3)} \cdot \frac{a^2-8a+15}{a^2-3a+2} \div \frac{a^2-9}{a-1} \quad (38)$$

$$\frac{a+1}{a+4} \cdot \frac{2a^2+5a-12}{a^2+8a+16} \div \frac{2a^2-7a+6}{a^2-a-2} \quad (39)$$

$$\frac{a(a+2b)}{a-b} \cdot \frac{2a^3-6a^2b}{2a^3-2ab^2} \cdot \frac{a^2+3ab+2b^2}{a-3b} \quad (40)$$

$$\frac{(x-2)(x+3)}{(2x+1)(3x-1)} \cdot \frac{3x^2-7x+2}{2x^2-5x-3} \cdot \frac{x^2-9}{9x^2-6x+1} \quad (41)$$

$$-\frac{6(p-2)}{p+1} \cdot \frac{3p^2-6p}{-p^2+2p+3} \cdot \frac{2p^3-18p}{p^3+3p^2} \quad (42)$$

$$\frac{4(m-1)}{5m+3} \cdot \frac{(5m^2+12m-9)}{(25m^4-9m^2)} \cdot \frac{(4m^2+12m)}{(m^2+6m+9)} \div \frac{1}{(m^2-m)} \quad (43)$$

$$-\frac{a(a-2)}{2(3a+4)} \cdot \frac{(3a^3-7a^2+4a)}{(9a^2-16)} \div \frac{(4a^2+8a)}{(6a^3-24a)} \cdot \frac{1}{3-3a} \quad (44)$$

$$\frac{1}{6(x+2)} \cdot \frac{x^2+x-2}{x^2-2x+1} \cdot \frac{1}{18x-6} \div \frac{x^2+4x+4}{3x^2-4x+1} \quad (45)$$

$$\frac{1}{m} \cdot \frac{m^2-8m+16}{m^2-2m+1} \cdot \frac{m^2+3m-4}{m^3-4m^2} \div \frac{m^2-16}{m^2-m} \quad (46)$$

חיבור וחיסור שברים אלגבריים.

תשובות:

$$\frac{17}{3(x-2)}$$

3

$$\frac{19x-10}{5x(x-1)}$$

$$\frac{8m+11}{(m-2)(m+3)(m+7)}$$

$$\frac{6x-10}{(x+2)(x-2)}$$

$$\frac{a+x}{ax}$$

$$\frac{6}{a+5}$$

$$-\frac{3}{2x+3}$$

$$\frac{3}{2(3x+4)}$$

$$\frac{1}{x-3}$$

$$\frac{m+6}{m+5}$$

$$\frac{a+5}{a+4}$$

$$\frac{2}{a+3}$$

$$\frac{a-3}{a}$$

$$\frac{4}{(3a-1)(3a+1)}$$

$$\frac{3x-1}{x(x-2)}$$

$$\frac{m+2}{m(m-3)}$$

בצע את הפעולות, צמצם את התוצאה:

$$\frac{4}{x-2} + \frac{5}{3x-6} \quad (47)$$

$$\frac{6m}{2m-3} + \frac{9}{3-2m} \quad (48)$$

$$\frac{2}{x} + \frac{3}{x-1} - \frac{6}{5x-5} \quad (49)$$

$$\frac{3}{m^2+m-6} + \frac{5}{m^2+10m+21} \quad (50)$$

$$\frac{x}{x^2-4} + \frac{5}{x+2} \quad (51)$$

$$\frac{a}{xa-x^2} - \frac{x}{a^2-ax} \quad (52)$$

$$\frac{7}{a+5} - \frac{3}{a-5} + \frac{2a+20}{a^2-25} \quad (53)$$

$$\frac{2x^2-3x+9}{4x^2-9} - \frac{x}{2x-3} \quad (54)$$

$$\frac{x}{3x-4} - \frac{3}{6x+8} - \frac{3x^2-5x+12}{9x^2-16} \quad (55)$$

$$\frac{x+1}{x^2-9} - \frac{1}{3x-x^2} + \frac{1}{x^2+3x} \quad (56)$$

$$\frac{m}{m+2} + \frac{3}{m+5} + \frac{6}{m^2+7m+10} \quad (57)$$

$$\frac{a}{a+1} + \frac{5}{a+4} - \frac{3a}{a^2+5a+4} \quad (58)$$

$$\frac{3a-7}{a^2-5a+6} - \frac{5}{a^2+a-6} - \frac{a+9}{a^2-9} \quad (59)$$

$$\frac{a^2+6a-7}{a^2+10a+21} + \frac{2a-6}{a^2-3a} - \frac{a+15}{a^2+3a} \quad (60)$$

$$\frac{2}{a-2} - \frac{3-3a}{1-9a^2} - \frac{5a}{3a^2-7a+2} \quad (61)$$

$$\frac{x+3}{x^2+2x} + \frac{2}{x-2} + \frac{4}{x^3-4x} \quad (62)$$

$$\frac{3m-2}{m^2-3m} - \frac{2}{m+3} + \frac{12-8m}{m^3-9m} \quad (63)$$

$$\frac{-2}{(x-3)(x+3)} \quad \frac{3x-1}{2x^2-18} - \frac{2x}{3(x^2-6x+9)} - \frac{5x^2-30x-27}{6(x-3)(x^2-9)} \quad (64)$$

$$\frac{a-2}{a+5} \quad a \left(\frac{a-9}{a^2-25} + \frac{2}{a^2-5a} \right) \quad (65)$$

$$\frac{(3m-8)(m+2)}{(m+4)} \quad \left(\frac{m}{m+1} - \frac{4}{m+4} \right) \cdot \left(3m + \frac{m-8}{m-2} \right) \quad (66)$$

$$\frac{x+7}{x-3} \quad \left(1 + \frac{5}{x-3} \right) \cdot \left(1 + \frac{5}{x+2} \right) \quad (67)$$

$$\frac{1}{a+1} \quad \left(\frac{3a}{a^2-5a-6} - \frac{2a-1}{a^2-1} \right) \cdot \left(\frac{a^2-7a+6}{a^2+10a-6} \right) \quad (68)$$

$$\frac{3}{2a-3} \quad \left(\frac{1}{a^2-2a-3} + \frac{1}{2a^2-a-3} \right) \cdot \left(a - \frac{3}{a-2} \right) \quad (69)$$

$$\frac{28}{(a+5)(a-5)} \quad \frac{3a-15}{3a^2-6a} \cdot \frac{2a^2-8}{a^2-10a+25} + \frac{4-2a}{a^2+5a} \quad (70)$$

$$\frac{4-a}{6(a-1)} \quad \frac{a^2+2}{3a^2-3} - \frac{10a^2-4a}{5a^2-7a+2} : \frac{4a^2-4}{a^2-2a+1} \quad (71)$$

משוואות ומערכותיהן.

משוואות בנעלם אחד ממעלה ראשונה.

$$x = 2 \quad 7(2x-3) - 5(4-3x) = 4x+9 \quad (1)$$

$$x = -5 \quad 3(-5-4x) - (6-5x)2 = 7x+18 \quad (2)$$

$$x = -9 \quad -7(4x+3) + 4(5-4x) = 5(7-8x) \quad (3)$$

$$x = 4 \quad 1 + 23(4-3x) - (7x-5)14 = 11(5-12x) - 8x \quad (4)$$

אין פתרון $18x-9-13x-2x+11=34x+97-21x-85-10x \quad (5)$

אין פתרון $(2x-3)^2 - 3(x+1)^2 = (x-9)^2 \quad (6)$

$$x = -\frac{3}{2} \quad 4(x-1)^2 - (2x+3)^2 = 16x+49 \quad (7)$$

$$x = 7 \quad \frac{3x-1}{5} - (2x-14) = \frac{x+5}{3} \quad (8)$$

x כל מספר $(4x+1)^2 - (3x+5)^2 = 7x^2 - 22x - 24 \quad (9)$

$$x = 2 \quad \frac{6x+8}{4} - 7(x-3) = \frac{x+4}{6} + 11 \quad (10)$$

$$x = 4 \quad \frac{5x-8}{4} + 3(x-1) = 12 - \frac{x-4}{10} \quad (11)$$

$$x = \frac{2}{3} \quad (5x-6)^2 - (5x-2)(5x+2) = 0 \quad (12)$$

x כל מספר $(4x-3)^2 + (3x+2)^2 = (5x-1)^2 + 2(6-x) \quad (13)$

$$x = 9 \quad \frac{x+6}{5} - (x-15) = 13 - \frac{3x+5}{8} + \frac{x-9}{4} \quad (14)$$

$$x = 1 \quad \frac{7x+3}{2} - \frac{5x+1}{3} - 5(4x-6) = 14 - \frac{7x-2}{5} \quad (15)$$

$$x = 4 \quad \frac{4(5x-2)}{3} - \frac{6(3x+2)}{7} = 42 - \frac{5(7x-4)}{4} \quad (16)$$

$$x = -2 \quad \frac{8(x+5)}{3} - \frac{7(x-2)}{4} = 13 - \frac{(6x+2)}{5} \quad (17)$$

$$x = 20 \quad 7\left(\frac{x}{2} + \frac{x}{5}\right) - 4x = 18 \quad (18)$$

$$x = 24 \quad 5\left(\frac{x}{4} + \frac{x}{6}\right) - 3\left(\frac{x}{8} - \frac{x}{2}\right) = 77 \quad (19)$$

$$x = 40 \quad 3\left(\frac{x}{4} - \frac{x}{5}\right) - \left(\frac{x}{10} - \frac{x}{8}\right) = 7 \quad (20)$$

$$x = 5 \quad 8\left(\frac{x-5}{3} + \frac{x+2}{7}\right) + 3 = 2x + 1 \quad (21)$$

$$x = 1 \quad 3\left(\frac{x+4}{5} - \frac{x-5}{4}\right) - 5\left(\frac{x-1}{3} - \frac{x+5}{6}\right) = 11 \quad (22)$$

$$x = 2 \quad 7\left(\frac{x+3}{5} - \frac{5x-4}{6} + \frac{3x}{2}\right) - \left(\frac{3x+2}{4} - \frac{7x-2}{3}\right) = 23 - \frac{x-2}{20} \quad (23)$$

$$x = 6 \quad 5[x + 3(x-7)] + 8 = 23 \quad (24)$$

$$x = 3 \quad 2x + 7[18 - 3(x-6)] = 5x + 180 \quad (25)$$

$$x = -10 \quad 3x - 4[9 - (x+8)] = 2x - 54 \quad (26)$$

$$x = 6 \quad 20 - [3x - 5(6-x)] = 2x - 10 \quad (27)$$

$$x = 5 \quad 12 + 7[5x + 6(x-1)] = 415 + 4[12 - 3(x+4)] \quad (28)$$

$$x = 8 \quad 7x - 5[17 - 8(x+4)] = 591 - 7[5x - 4(x-3)] \quad (29)$$

$$x = 0 \quad 8x - 7[12 - 8(x-3) + 5(x-4)] = 2x - 148 - [3x + 5(x+4) - 7(x+8)] \quad (30)$$

$$x = 5 \quad 2x + 5\left[3x - \left(\frac{x+3}{4} - \frac{x+1}{6}\right)\right] = 80 \quad (31)$$

$$x = 4 \quad \frac{5x+1}{3} - 3\left[\frac{2x+2}{5} - \left(\frac{x+2}{2} - \frac{3x+4}{4}\right) - 4x\right] = 49 - \frac{3x}{4} \quad (32)$$

$$x \text{ - כל מספר} \quad 7(x-2) + 9(x+4) = 6(x+2) + 10(x+1) \quad (33)$$

$$x \text{ - אף מספר} \quad \frac{3x-5}{8} - \frac{151x+8}{40} = 7 - \frac{17x-3}{5} \quad (34)$$

$$x \text{ - אף מספר} \quad \frac{4(x-6)}{3} + \frac{11(x+3)}{6} = \frac{x+8}{2} + \frac{8(x-2)}{3} \quad (35)$$

$$x \text{ - כל מספר} \quad \frac{7}{6}(3x+4) - 4 \cdot \frac{2x-7}{3} = 3(2x+3) - \frac{31x}{6} + 5$$

$$x = 0 \quad \frac{x-7}{6} - \frac{9x+31}{12} = x - \frac{7x+15}{4} \quad (36)$$

$$x \text{ - אף מספר} \quad \frac{4(5x-8)}{3} - \frac{7(4x+9)}{6} = \frac{5(6x+7)}{3} - 8x - 7 \quad (37)$$

משוואות ריבועיות.

פתור את המשוואה (כולל מציאת תחום הגדרה)

$$x = \left\{ -6; \frac{25}{6} \right\} \quad (2x+5)(3x-2) = 140 \quad (1)$$

$$x = \{13; -3\} \quad (x-3)^2 - (x+2)(2x-20) = 10 \quad (2)$$

אין פתרון $(2x-1)(3x+21) = (x+5)^2 + 10(x-8) \quad (3)$

$$x = \left\{ 5; -\frac{7}{3} \right\} \quad (x+4)^2 - (x-4)^2 = 6(x+4)(x-4) + 26 \quad (4)$$

$$x = \{\pm 6\} \quad 2x^2 - 72 = 0 \quad (5)$$

x - אף מספר $4x^2 + 36 = 0 \quad (6)$

$$x = \{\pm 5\} \quad (2x-5)^2 - 3x(x-4) = 50 - 8x$$

$$x = \{5; 2\} \quad \frac{x+1}{2x-3} - \frac{7}{2x+3} = \frac{5x+4}{4x^2-9} \quad (7)$$

$$x = \{0; 2\} \quad 3x^2 + 24 = 6(x+4) \quad (8)$$

$$x = \{0; 4\} \quad (3x-7)^2 - (x-5)^2 = 24 \quad (9)$$

x - כל מספר $x^2 - 9 - (x+3)(x-3) = 0 \quad (10)$

$$x = 8 \quad \frac{1}{x-5} - \frac{5}{3x+15} = \frac{8}{x^2-25} \quad (11)$$

$$x = 6 \quad \frac{x-3}{x+2} + \frac{x-1}{x-2} = \frac{x^2+16}{x^2-4} \quad (12)$$

$$x = \left\{ -6; \frac{5}{3} \right\} \quad \frac{x-42}{12-3x^2} + \frac{4}{2-x} = 1 \quad (13)$$

$$x = 1 \quad \frac{x+5}{4x^2-1} + \frac{3}{4x+2} = \frac{3-x}{2x-1} + \frac{1}{2} \quad (14)$$

$$x = 2 \quad \frac{1}{x^2-1} - \frac{1}{2x+2} = \frac{1}{x^2+x} \quad (15)$$

x - אף מספר $\frac{x^2-x-2}{x-2} = 3 \quad (16)$

$$x = \left\{ 2; -\frac{1}{4} \right\} \quad \frac{x+1}{3x-3} - \frac{1}{2x^2-2} - \frac{2x-1}{6x+6} = \frac{2}{3} \quad (17)$$

$$x = 10 \quad \frac{20}{x^2-8x} - \frac{x-10}{x^2+8x} = \frac{36}{x^2-64} \quad (18)$$

$$x \text{ - אף מספר} \quad \frac{x}{x+3} + \frac{x}{x-3} = \frac{18}{x^2-9} \quad (19)$$

$$x = \left\{ 7; \frac{45}{13} \right\} \quad \frac{x-3}{(x-5)^2} - \frac{3x-6}{x^2-25} - \frac{9}{2x+10} = 0 \quad (20)$$

$$x = 56 \quad \frac{5x+28}{3x^2+6x} - \frac{5}{2x-4} = \frac{10-x}{x^2-4} \quad (21)$$

$$x = \left\{ 3; -\frac{2}{11} \right\} \quad \frac{4-x}{x^2-4x+4} - \frac{2x+3}{3x^2-12} = \frac{2}{x+2} \quad (22)$$

$$x = \left\{ 3; \frac{14}{5} \right\} \quad \frac{x+6}{3x+3} + \frac{3x}{10+2x} = 1 + \frac{4x-2}{x^2+6x+5} \quad (23)$$

$$x = 1 \quad \frac{5x+7}{x^2+6x+9} + \frac{4}{9-x^2} = \frac{10}{2x+6} \quad (24)$$

$$x = \left\{ 1; \frac{4}{15} \right\} \quad \frac{5}{3x+2} - \frac{2-5x}{6x-9x^2} + \frac{5(x-1)}{4-9x^2} = 0 \quad (25)$$

$$x = \{2; -20\} \quad \frac{6}{2x+5} - \frac{11-8x}{15-6x} = \frac{1}{3} - \frac{20-14x^2}{50-8x^2} \quad (26)$$

$$x = \left\{ -4; -\frac{26}{3} \right\} \quad \frac{x}{x^2-4x-12} - \frac{x+14}{x^2-36} = \frac{3}{5x+30} \quad (27)$$

$$x = \{1; -21\} \quad \frac{8}{(x+3)^2} - \frac{4}{x^2-9} = \frac{10}{x^2-9x+18} \quad (28)$$

$$x = \{2; -63\} \quad \frac{8}{x^2+3x} - \frac{2}{5x^2-15x} = \frac{10}{x^2+6x+9} - \frac{3}{x^2-9} \quad (29)$$

$$x = \left\{ 1; -\frac{46}{75} \right\} \quad \frac{x+6}{25x^2-4} - \frac{3}{2-5x} = \frac{x+11}{25x^2-20x+4} \quad (30)$$

$$x = \{2; -8\} \quad \frac{5-x}{x^2+4x+3} + \frac{3x+2}{x^2-2x-15} = \frac{3}{x^2-4x-5} \quad (31)$$

$$x = \{2; -63\} \quad \frac{8}{x^2+6x+9} + \frac{4}{9-x^2} = \frac{10}{x^2-9x+18} \quad (32)$$

משוואות בחזקות גבוהות.

$$\left\{ \pm 3; 1; \frac{3}{2} \right\} \quad (x^2 - 9)(2x^2 - 5x + 3) = 0 \quad (33)$$

$$\{0, 1, -3\} \quad 3x^4 + 6x^3 - 9x^2 = 0 \quad (34)$$

$$\{-5, 0, 3\} \quad -9x(x+5) = 8x^3 \quad (35)$$

$$\left\{ 3; -3; -\frac{5}{3} \right\} \quad 3x^3 + 5x^2 - 27x - 45 = 0 \quad (36)$$

$$\{\pm 2, \pm 3\} \quad x^4 - 13x^2 + 36 = 0 \quad (37)$$

$$\{\pm 1, \pm 3\} \quad x^2(x^2 - 9) + 5 = x^2 - 4 \quad (38)$$

$$\{\pm 2, \pm 1\} \quad \frac{x^2 + 2}{x^2 - 2} = 2x^2 - 5 \quad (39)$$

$$\{1, 2\} \quad x^6 - 19x^3 = 216 \quad (40)$$

$$\{\pm 1, 4, 6\} \quad (x^2 - 5x)^2 - 2(x^2 - 5x) - 24 = 0 \quad (41)$$

$$\left\{ 1, \frac{5}{2}, 4, -\frac{1}{2} \right\} \quad (2x^2 - 7x)^2 + 2x^2 - 7x = 20 \quad (42)$$

$$\{2, 3, 4, 6\} \quad \left(x + \frac{12}{x}\right)^2 - 15\left(x + \frac{12}{x}\right) + 56 = 0 \quad (43)$$

$$\{3, -6\} \quad 5x^3 + 15x^2 - 90x = 0 \quad (44)$$

$$\left\{ -4, -\frac{5}{3} \right\} \quad 3x^3 + 17x^2 + 20x = 0 \quad (45)$$

$$\left\{ \frac{1}{2}, -\frac{5}{3} \right\} \quad 6x^3 + 7x^2 - 5x = 0 \quad (46)$$

$$\{\pm 2, 3\} \quad (x^2 - 4)(3x - 9) = 0 \quad (47)$$

$$\left\{ -1, 0, \frac{1}{2}, 1, 2 \right\} \quad (2x^2 - 3x + 1)(3x^2 - 3)(x^2 - 2x) = 0 \quad (48)$$

$$x = \left\{ 0, -\frac{25}{4}, 1 \right\} \quad x^2(2x - 5)^2 = x^3(8x + 1) \quad (49)$$

$$x = \{\pm 1, -2, -4\} \quad (x+1)^2(x+2)^2 = 6(x+2)(x+1) \quad (50)$$

$$x = \{\pm 2, -1, -3\} \quad x^2 - 4 - (x+2)^3(x-2) = 0 \quad (51)$$

$$x = \{-1, 7\} \quad (x+1)^2 = (x+1)(x^2 - 5x - 6) \quad (52)$$

$$x = \{3, -1, -4\} \quad (3x^2 - 5x - 12)(x^2 - 9) = -2x^3 + 12x^2 - 18x \quad (53)$$

מערכות משוואות

פתור את מערכות המשוואות הנתונות:

תשובות:

- | | |
|--|---|
| $(6,2), (-2,-6)$ | $\begin{cases} 3(x^2 + y^2) = 10xy \\ x - y = 4 \end{cases} \quad (1)$ |
| $\left(\frac{5}{4}, -\frac{11}{4}\right), (2,-5)$ | $\begin{cases} 8x^2 + 4xy - 3y = 7 \\ 3x + y - 1 = 0 \end{cases} \quad (2)$ |
| $(7,2)$ | $\begin{cases} (x-2y)^2 + (y+5)^2 = 8x+2 \\ y-x+5=0 \end{cases} \quad (3)$ |
| $\left(-\frac{85}{7}, 39\right), (2,6)$ | $\begin{cases} y^2 + 3xy + 2x = 76 \\ 7x + 3y = 32 \end{cases} \quad (4)$ |
| <p style="text-align: center;">אין פתרון \emptyset</p> | $\begin{cases} x^2 - 3y^2 + xy = 54 \\ x - y = 3 \end{cases} \quad (5)$ |
| $\left(\frac{49}{13}, -\frac{15}{13}\right), (5,-3)$ | $\begin{cases} (y+3)^2 + (x-2)^2 = 2x-1 \\ 3x+2y-9=0 \end{cases} \quad (6)$ |
| $\left(8, \frac{16}{3}\right), (4,4)$ | $\begin{cases} (3y-2x)^2 + (x-3)^2 = 6y-7 \\ 3y-x-8=0 \end{cases} \quad (7)$ |
| $(-10,-6.4), (9,5)$ | $\begin{cases} x^2 - xy = 36 \\ 3x - 5y = 2 \end{cases} \quad (8)$ |
| <p style="text-align: center;">אין פתרון \emptyset</p> | $\begin{cases} x^2 - y^2 = 36 \\ 2x^2 - 9 = 2y^2 \end{cases} \quad (9)$ |
| $\left(-\frac{85}{7}, 39\right), (2,6)$ | $\begin{cases} y^2 + 3xy + 2x = 76 \\ 7x + 3y = 32 \end{cases} \quad (10)$ |
| <p style="text-align: center;">אינסוף פתרונות $(1-3a, a)$</p> | $\begin{cases} x^2 - 5yx = 1 + 5y - 8y(x+1) \\ 3y + x = 1 \end{cases} \quad (11)$ |
| $\left(-\frac{1}{2}, \frac{1}{3}\right), (8,6)$ | $\begin{cases} \frac{4}{x} + \frac{3}{y} = 1 \\ 3y - 2x = 2 \end{cases} \quad (12)$ |
| $(5,3)$ | $\begin{cases} 3y^2 + y - 3x - xy = 0 \\ x = \frac{xy + y + 2}{y + 1} \end{cases} \quad (13)$ |

$$\left(-\frac{4}{5}, \frac{1}{20}\right), (7, 2) \quad \begin{cases} \frac{11}{3x+1} - \frac{12}{5y-2} = -1 \\ 4y - x = 1 \end{cases} \quad (14)$$

$$(-4, 3), (4, -3) \quad \begin{cases} x^2 + xy = 4 \\ 3x + 4y = 0 \end{cases} \quad (15)$$

$$(-1, -9), (2, 3) \quad \begin{cases} y - x^2 + 7 = 3x \\ 3 + x^2 + y = 5x \end{cases} \quad (16)$$

$$\left(\frac{5}{2}, 2\right) \quad \begin{cases} \frac{y-3}{x-3} = \frac{2x+1}{y+1} \\ y - 2x + 3 = 0 \end{cases} \quad (17)$$

$$\left(-\frac{10}{3}, \frac{5}{3}\right), (10, 15) \quad \begin{cases} \frac{80}{x} + \frac{60}{y} = 12 \\ y - x = 5 \end{cases} \quad (18)$$

$$\left(\frac{10}{9}, -\frac{4}{3}\right), (12, 15) \quad \begin{cases} \frac{60}{x} + \frac{60}{y} = 9 \\ \frac{x}{2} = \frac{y}{3} + 1 \end{cases} \quad (19)$$

$$\left(\frac{1}{2}, 1\right), (-3, -1) \quad \begin{cases} -2x^2 + 7xy = 3 \\ 4x - 7y + 5 = 0 \end{cases} \quad (20)$$

$$(2, 3), (-1, -9) \quad \begin{cases} y - x^2 + 7 = 3x \\ 3 + x^2 + y = 5x \end{cases} \quad (21)$$

$$(8, 10) \quad \begin{cases} \frac{4x+18}{5} - \frac{3y-6}{6} = 6 \\ \frac{3y+5}{7} + \frac{13-2x}{3} = 4 \end{cases} \quad (22)$$

$$(9, -6) \quad \begin{cases} \frac{x+1}{2} - \frac{x-y+10}{5} - \frac{2x+3y}{3} = 0 \\ 2 - \frac{5x-y}{3} + \frac{1}{4}(6x-y) = 0 \end{cases} \quad (23)$$

$$(2, 1) \quad \begin{cases} 3x - \frac{2(2y-x)}{3} = 6 \\ 6y - \frac{5x+3y}{6} = \frac{x}{2} + 2\frac{5}{6} \end{cases} \quad (24)$$

$$(3,5) \quad \begin{cases} \frac{5x-3y+6}{4} - \frac{2x-y+2}{6} = 1 \\ \frac{4y-3x+7}{6} + \frac{x-5y-10}{8} = -1 \end{cases} \quad (25)$$

$$(5,10) \quad \begin{cases} 4x - 2 \cdot \frac{y-5}{5} - y = \frac{x+y}{3} + 3 \\ y - \frac{3}{4}(x-1) = x + \frac{x-y}{5} + 3 \end{cases} \quad (26)$$

$$\emptyset \text{ אין פתרון} \quad \begin{cases} 5(2x-1) + y = 3(y-1) \\ 2(y-x) = 3(x+1) + y \end{cases} \quad (27)$$

$$(3,-2) \quad \begin{cases} \frac{x+6}{2} - \frac{6y-x}{6} = 7 \\ \frac{3x-5y+6}{5} = 8 - \frac{2x+y+5}{3} \end{cases} \quad (28)$$

$$\text{אינסוף, } (12+3a, a) \quad \begin{cases} 2(x-y) = 4(y+6) \\ 3(x-y) - 4 = 2(x+4) \end{cases} \quad (29)$$

שיטת גאוס

$$(1, -3, -2) \quad \begin{cases} 2x + y - 3z = 5 \\ 3x - 2y + 2z = 5 \\ 5x - 3y - z = 16 \end{cases} \quad (30)$$

$$(2, 4, 3) \quad \begin{cases} 2x - y - z = 2 \\ x + 4y - 2z = 10 \\ x - 2y + 2z = 10 \end{cases} \quad (31)$$

$$(0, 0, 0) \quad \begin{cases} x + 3y - 2z = 0 \\ 2x - 3y + z = 0 \\ 3x - 2y + 2z = 0 \end{cases} \quad (32)$$

$$(1-a, a, 0) \quad \begin{cases} x + y + z = 1 \\ -x - y + 2z = -1 \\ x + y + 4z = 1 \end{cases} \quad (33)$$

$$\emptyset \text{ אין פתרון} \quad \begin{cases} x + y = 3 \\ x + 2y = 5 \\ 2x + y = 4 \\ 2x + 3y = 1 \end{cases} \quad (34)$$

$$(2a+4.5, 3a+3, a) \quad \begin{cases} 2x - 3y + 5z = 0 \\ 8x - 5y - z = 21 \\ 2x + 4y - 16z = 21 \end{cases} \quad (35)$$

$$\emptyset \text{ אין פתרון} \quad \begin{cases} 2x + 3y - 2z = 5 \\ x - 2y + 3z = 2 \\ 4x - y + 4z = 1 \end{cases} \quad (36)$$

$$(-1-7a, 2+2a, a) \quad \begin{cases} x + 2y + 3z = 3 \\ 2x + 3y + 8z = 4 \\ 3x + 2y + 17z = 1 \end{cases} \quad (37)$$

$$(0, 0, 0, 0) \quad \begin{cases} 2x + 2y + 2z - w = 0 \\ 4x + 3y + 2z - 2w = 0 \\ 8x + 5y + 6z - 4w = 0 \\ 3x + 3y + 4z - 2w = 0 \end{cases} \quad (38)$$

$(3, -1)$

$$\begin{cases} 2x + 3y = 3 \\ x - 2y = 5 \\ 3x + 2y = 7 \end{cases} \quad (39)$$

אין פתרון \emptyset

$$\begin{cases} x + y + z - w = 1 \\ 2x + y - z + 2w = 3 \\ x + 2y + 4z - 5w = 1 \end{cases} \quad (40)$$

$\left(-\frac{8a}{11}, \frac{10a}{11}, a\right)$

$$\begin{cases} x + 3y - 2z = 0 \\ x - 8y + 8z = 0 \\ 3x - 2y + 4z = 0 \end{cases} \quad (41)$$

$(19, 20, 1)$

$$\begin{cases} 2(x - y) + 3(x - z) = x + 2y - 7 \\ 3(5 - x) + 2(z + y) = 0 \\ x + 5 - y + 2(z - 1) = 4 \end{cases} \quad (42)$$

$(0, 1, a - 2, a)$

$$\begin{cases} 2x + 3y - z + w = 5 \\ x - y + 2z - 2w = -5 \\ 3x + y + 2z - 2w = -3 \\ 3x - y - 2z + 2w = 3 \end{cases} \quad (43)$$

$\left(\frac{1}{3}t, 2 - \frac{4}{3}t, t\right)$

$$\begin{cases} x + y + z = 2 \\ x + 4y + 5z = 8 \\ 2x - y - 2z = -2 \\ 2x + 5y + 6z = 10 \end{cases} \quad (44)$$

$(1 - a - p, 1 - p, p, a)$

$$\begin{cases} 2x_1 - x_2 + x_3 + 2x_4 = 1 \\ x_1 + x_2 + 2x_3 + x_4 = 2 \\ 3x_1 - 2x_2 + x_3 + 3x_4 = 1 \end{cases} \quad (45)$$

$\left(\frac{1}{2} + t, -\frac{7}{2}t, 0\right)$

$$\begin{cases} x - y - z - 2w = 4 \\ 2x - 2z + 5w = 1 \\ -x - 3y + z - 10w = 10 \end{cases} \quad (46)$$

$(1, 2, 3)$

$$\begin{cases} 2x + y + z = 7 \\ 3x - 2y + z = 2 \\ 4x - 2y - z = -3 \\ x + y + z = 6 \\ x + 3y - 2z = 1 \end{cases} \quad (47)$$

$(a, 0, a, 0, a, 0)$

$$\begin{cases} x_1 - x_3 = 0 \\ x_2 - x_4 = 0 \\ -x_1 + x_3 = 0 \\ -x_2 + x_4 - x_6 = 0 \\ -x_3 + x_5 = 0 \\ -x_4 + x_6 = 0 \end{cases} \quad (48)$$

$(1, 3, 1)$

$$\begin{cases} 2x + y + 3z - w + t = 2 \\ x - 2y + z + 3w - t = 1 \\ 3x + 4y + 5z - 5w + 3t = 3 \\ x + 3y + 2z - 4w + 2t = 1 \\ 5x - 5y + 6z + 8w - 2t = 4 \end{cases} \quad (49)$$

אין פתרון

$$\begin{cases} 2x_1 + x_2 + 3x_3 - x_4 + x_5 = 2 \\ 1x_1 - 2x_2 + x_3 + 3x_4 - x_5 = 1 \\ 3x_1 + 4x_2 + 5x_3 - 5x_4 + 3x_5 = 3 \\ x_1 + 3x_2 + 2x_3 - 4x_4 + 2x_5 = 1 \\ 5x_1 - 5x_2 + 6x_3 + 8x_4 - 2x_5 = 4 \end{cases} \quad (50)$$