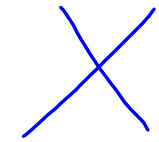
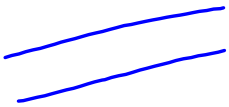
Solving Systems of Equations Algebraically

Consistent→ a system of equations that has at least one solution
Inconsistent → a system that has no solutions
If a system of two linear equations in two variables has an infinite number of solutions, the equations are **dependent**. Otherwise, they are **independent**.



Consistent
Independent



Inconsistent
independent

Consistent
dependent

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Solve. Classify as consistent or inconsistent. Dependent or independent.

Solve the following systems by substitution.

1. $2x - y = -7$

$x = 2y - 8$

$2(2y-8) - y = -7$
$4y - 16 - y = -7$
$3y = 9$
$y = 3$

$x = 2(3) - 8$
$x = -2$ $(-2, 3)$

Consistent
independent

(2) $x - 2y = 5$
$2x + y = 3$ $y = -2x + 3$

$x - 2(-2x+3) = 5$
$x + 4x - 6 = 5$
$5x - 6 = 5$
$5x = 11$
$x = 11/5$

$11/5 - 2y = 5$
$-2y = \frac{25}{5} - \frac{11}{5}$
$\frac{-2y}{-2} = \frac{14/5}{-2}$
$y = \frac{14}{5} \cdot \frac{-1}{2} = \frac{-14}{10} = \frac{-7}{5}$

$\left(\frac{11}{5}, \frac{-7}{5}\right)$
Consistent
independent

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Solve the following systems by elimination.

3. $3x - 2y = 4$

$(2x + y = -1)2$

$3x - 2y = 4$

$4x + 2y = -2$

$7x = 2$

$x = 2/7$

$2(2/7) + y = -1$

$4/7 + y = -1$

$y = -1 - 4/7$

$y = -7/7 - 4/7 = -11/7$

$(2/7, -11/7)$

Consistent independent

4. $\left(\frac{x}{3} - \frac{y}{2} = -3\right)6$

$\left(\frac{2x}{5} + \frac{y}{5} = -2\right)5$

$2x - 3y = -18$

$(2x + y = -10)-1$

$2x - 3y = -18$

$-2x - y = 10$

$-4y = -8$

$y = 2$

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

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

$\frac{x}{3} = -2 \rightarrow x = -6$

$(-6, 2)$

Consistent independent

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5. $(2x - 8y = 2)3$

$(3x - 12y = 3)-2$

$6x - 24y = 6$

$-6x + 24y = -6$

$0 = 0$

$x - 4y = 1$

$x - 4y = 1$

→ True, Infinite solutions

Consistent dependent

6. $(2x + 5y = 8)-3$

$6x + 15y = 18$

$-6x - 15y = -24$

$6x + 15y = 18$

$0 = -6$

$m = -2/5$ parallel lines

False - contradiction

$\emptyset$ or $\{\}$

inconsistent independent

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Eq

7. ① $x + 2y + 3z = -2$

② $2x + 6y + z = 2$

③ $3x + 3y + 10z = -2$

St.1 Elim x for ① and ②

$-2$① + ②

$-2x - 4y - 6z = 4$

$2x + 6y + z = 2$

$2y - 5z = 6$ ④

St.2 Elim x for ① and ③

$-3$① + ③

$-3x - 6y - 9z = 6$

$3x + 3y + 10z = -2$

$-3y + z = 4$ ⑤

St.3 Solve for y and z (elim)

$2y - 5z = 6$

$(-3y + z = 4)5$

$2y - 5z = 6$

$-15y + 5z = 20$

$-13y = 26$

$y = -2$

$-3(-2) + z = 4$

$6 + z = 4$

$z = -2$

St.4 x = ___

① $x + 2(-2) + 3(-2) = -2$

$x - 4 - 6 = -2$

$x = 8$

$x = 8$

$y = -2$

$z = -2$

or $(8, -2, -2)$

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Do the following as part of your homework:

$3x - 2y + z = -3$

$-x + y - 2z = -5$

$x + y + z = 5$

Homework: PP. 683 - 684

#17,24,25,27,32,34,36,39

and the problem above

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