Distinct or Coincident Lines (1.7) Feb 11/2011

Remember the linear systems that we solved by graphing in our first lesson?

a) $y = 2x + 4$
$y = 2x$

b) $y = 2x + 4$
$y = -x + 4$

c) $y = x - 3$
$4x - 4y = 12$

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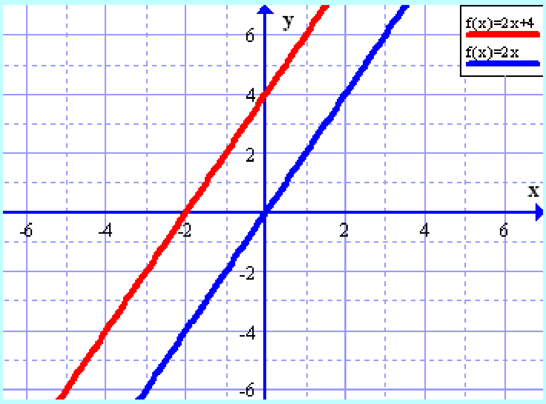
a) $y = 2x + 4$
$y = 2x + 0$



These lines are parallel and distinct, there was no solution to the system.

What would happen when you solve this system algebraically?

Feb 11-7:36 AM

Solve the following linear system using an algebraic method.

$y = 2x + 4$ ①
$y = 2x$ ②

Sub ① into ② (setting y=y)

$2x+4 = 2x$

$4 = 2x - 2x$

$\boxed{4 = 0x}$

mathematically false statement
→ never true

∴ no solutions

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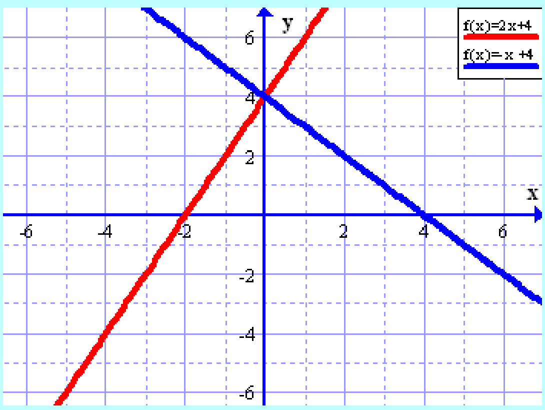
b) $y = 2x + 4$
$y = -x + 4$



These lines are not parallel, there was **one** solution to the system.

What would happen when you solve this system algebraically?

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Solve the following linear system using an algebraic method.

$y = 2x + 4 \longrightarrow 2x - y = -4$ ①

$y = - x + 4 \longrightarrow x + y = 4$ ②

add $3x = 0$

$\boxed{x = 0}$

sub $x = 0$ into ②

$0 + y = 4$

$\boxed{y = 4}$

∴ one solution, (0,4)

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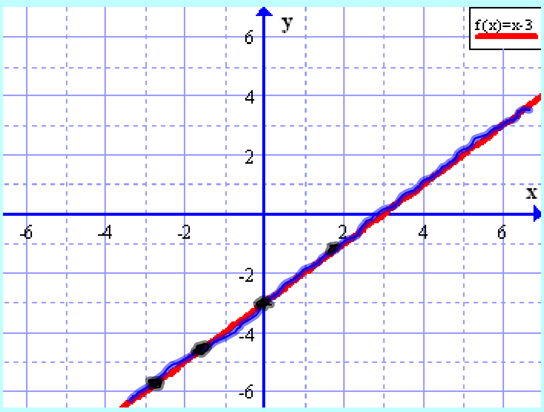
c) $y = x - 3$

$4x - 4y = 12$



These lines are the same (<u>coincident</u>), there were **infinitely many** solutions to the system.

What would happen when you solve this system algebraically?

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Solve the following linear system using an algebraic method.

$y = x - 3 \longrightarrow -x + y = -3$ ①

$4x - 4y = 12$ ②

① $\times 4$: $-4x + 4y = -12$

add: $0x + 0y = 0$

"since" $\boxed{0 = 0}$

$\because$ statement is always true

$\therefore$ infinite solutions

"therefore"

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When solving a linear system algebraically:

Exactly One Solution:

- you can find the value of one of the variables and then solve for the other.

No Solution:

- you end up with an untrue statement.
  e.g. $0x = 2$ is never true
- these lines are distinct.

Infinitely Many Solutions:

- you end up with a statement which is true for any value of x.
- $0x = 0$ is always true
- these lines are coincident.

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Ex. 1) Write a linear system with:

a) infinitely many solutions

$$x + y = 1 \quad (1)$$
$$2x + 2y = 2 \quad (2)$$

(1)x2: $2x + 2y = 2$

subtract $0 = 0$

b) no solution

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

Sub (1) into (2)

$$3x - 5 = 3x + 7$$
$$-3x + 5 \qquad -3x + 5$$

$$0 = 12$$

State why it satisfies the condition and then solve the system.

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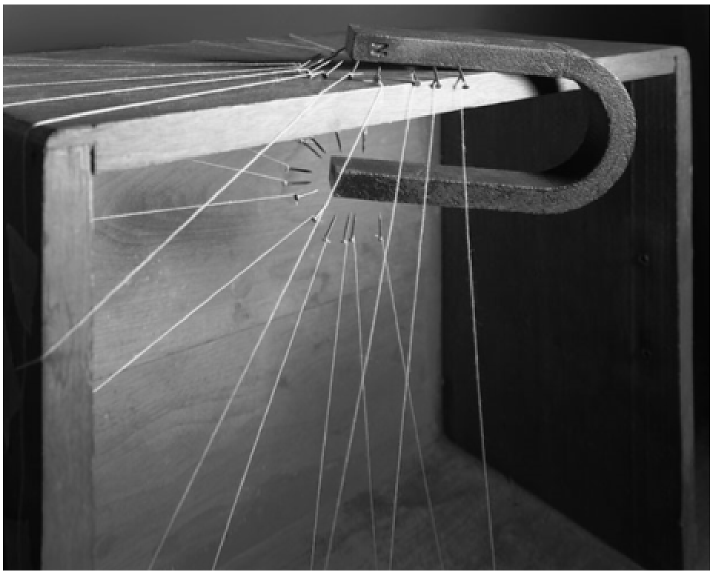
Assigned Work:
p. 59 # 1, 2a, 3abcfh, 4, 6*



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3(f) $3x - 5y - 2 = 0$

$4x + 5y + 2 = 0$

$3x - 2 = 5y$

$\frac{3}{5}x - \frac{2}{5} = y$

$5y = -4x - 2$

$y = -\frac{4}{5}x - \frac{2}{5}$

$\frac{7x}{7} = \frac{0}{7}$

$x = 0$

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3(h) $2x - 5 = 4y$ ①

$0.01x - 0.02y = 0.25$

$x - 2y = 25$ ②

② $\times 2$: $2x - 4y = 50$

① $\rightarrow$: $2x - 4y = 5$

Subtract $0 + 0 = 45$

$0 = 45$?

$\therefore$ no solution!

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