1-13-16

Lecture 3 January 13th

Finish Appendix Section 7 if needed.

Appendix Section 8 word problems

1) Simple interest: (the interest is not compounding)

$$I = P r t$$

I: interest; P: principal; r: interest rate; t: time

ex Deposit \$1000 (principal) = P

interest = 6% = r

time = 2 years = t

$\rightarrow I = \$1000 \cdot .06 \cdot 2$

$= 1000 \cdot .12$

$= 120$

The interest is \$120

ex Borrow \$500 for 6 Months, interst is 10% per year.

$I = 500 \cdot .10 \cdot 1/2$

$= 25$ dollars

ex Borrow \$500 for 6 Months interest is 10% per Month.

$I = 500 \cdot .10 \cdot 6$

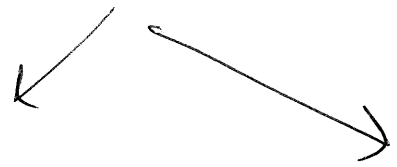
$= 300$ dollars

- Blending problem (omit for now)

- Uniform motion.

Moving at a constant speed. (rate)

Distance = rate · time.



500? = 50 mph · 10 minutes

Wrong

500 miles = 50 mph · 10 hours.

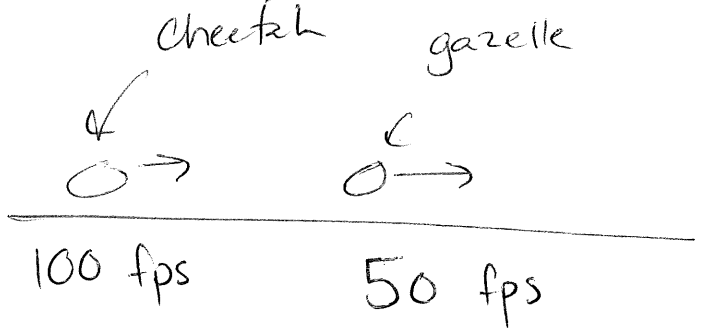
right ✓

easy: Orlando is 140 miles away. How long does the drive take if driving at 70 mph?

$140 = 70 \cdot t \rightarrow t = 2$ hours.

~~hard~~: Jack leaves Orlando driving 70 mph. Jill leaves Jax driving 60 mph. When and where do they meet?

harder:



the gazelle has a ~~100 feet/second~~ 100 feet head start. How long + far does the Cheetah run?

caught at time t.

$d = rt$

$d = 100(t)$ Cheetah

$(d - 100) = 50(t)$ gazelle

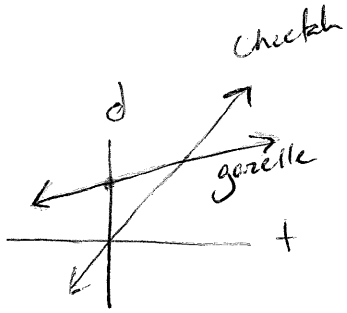
$d = 50t + 100$

set equal to each other.

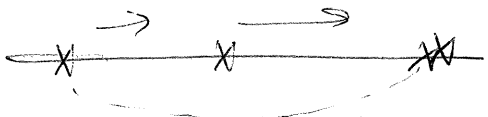
$100(t) = 50(t) + 100$

$50(t) = 100$

$t = 2$ seconds.



Check answer, Makes sense!



2 seconds
200 feet.

example. working together on a job.

- Jack takes 2 hours to paint a room and Jill takes 2 hours to paint a room. How about if they work together?

  = 1 hour.

Jack takes 4 hours, Jill takes 2 hours, now what?

in one hour, Jack has painted 1/4
Jill has painted 1/2.
together. 3/4 in one hour.

how many hours until done?

$\frac{1}{3/4}$ = 4/3 hours 1:20.

See 11.1

See 11.1

Systems of linear equations.

ex) Drinks are $2
Snacks are $3 → $2x + 3y = 30$
made $30
lets say 12 items sold total.
How many of each?

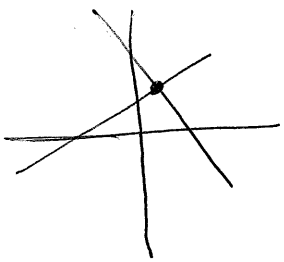
$2x + 3y = 30$
$x + y = 12$

is there an x, y that makes this work?

$x=6, y=6$

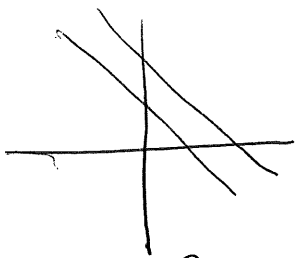
this is a system of equations.

there are three scenarios:



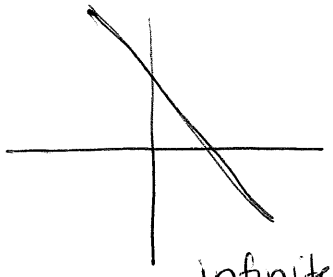
One answer intersection

$2x+3y=30$
$x+y=12$



No answer intersection

$x+y=3$
$x+y=5$



Infinite answers, intersections.

$x+y=6$
$2x+2y=12$

There are 2 ways to solve a system:

Substitution

$2x + 3y = 30$

$x + y = 12$ ← solve for y.

$y = -x + 12$.

Substitute into the other.

$2x + 3(-x + 12) = 30$

$2x - 3x + 36 = 30$

$-x = -6 \rightarrow x = 6$.

$6 + y = 12 \rightarrow y = 12$.

Elimination

$2x + 3y = 30$

$x + y = 12$ ⇒

$2x + 3y = 30$

$-2x - 2y = -24$

$y = 6$

$\rightarrow x = 6$

Those were examples of 1 solution.

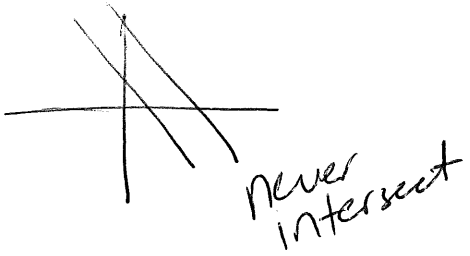
No solution example:

$$2x + y = 5$$
$$4x + 2y = 8$$

$\rightarrow$

$$-4x - 2y = -10$$
$$4x + 2y = 8$$
$$0 = -2 \ ?$$

Never true



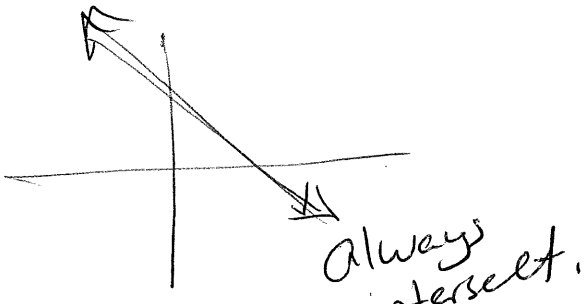
infinite solution example:

$$2x + y = 5$$
$$4x + 2y = 10$$

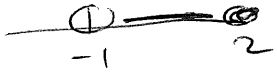
$\rightarrow$

$$-4x - 2y = -10$$
$$4x + 2y = 10$$
$$0 = 0$$

Always true.



A9) interval notation & inequalities.

interval	inequality	graph / shading
$(-1, 2)$	$-1 < x < 2$	
$[-1, 2]$	$-1 \leq x \leq 2$	
$[-1, 2)$	$-1 \leq x < 2$	
$(-1, 2]$	$-1 < x \leq 2$	
$[-1, \infty)$	$-1 \leq x$ $\quad x \geq -1$	
$(-1, \infty)$	$-1 < x$ $\quad x > -1$	
$(-\infty, 2]$	$x \leq 2$	
$(-\infty, 2)$	$x < 2$	
$(-\infty, \infty)$	$x =$ anything	

infinity is a number?

$(2, -1)$ wrong or right?

Rules

- $a^2 \geq 0$
- $6 > 4$ divide by negative 2, multiply by negative 1.

$-3 < -2$ $\quad -6 < -4$

* Always be careful about dividing by a negative.

$x^2 < x \rightarrow x < 1$? no.

ex $\quad 4x + 7 \geq 2x - 3$ same as equation.

$2x \geq -10$

$x \geq -5$

ex $\quad -5 < 3x - 2 < 1$ means "and."

$-5 < 3x - 2$ and $3x - 2 < 1$

$-3 < 3x$

$-1 < x$ and $3x < +3$

$x < 1$

ex $\frac{1}{4x-1} > 0$

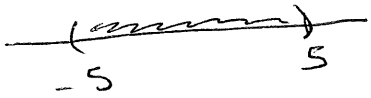
What does this mean about $4x-1$?

$4x-1 > 0$

$x > 1/4$.

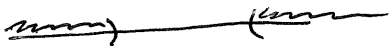
Inequalities combined with absolute values.

$|x| < 5$



$(-5, 5)$

$|x| > 5$



$(-\infty, -5) \cup (5, \infty)$.

rules

$|x| < a \rightarrow -a < x < a$

$-a < x$ and $x < a$.

$|x| > a \rightarrow x > a$ or $x < -a$

Example

$$|2x+4| \leq 3$$

$$-3 \leq 2x+4 \leq 3$$

↳ $-3 \leq 2x+4$ and $2x+4 \leq 3$

$x \geq -\frac{7}{2}$ and $x \leq -\frac{1}{4}$

3 ways to write answer.

$(-7/2, -1/4)$

$-7/2 < x < -1/4$

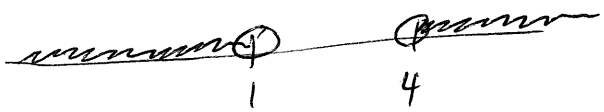
Example $|2x-5| > 3$

$2x-5 > 3$ or $2x-5 < -3$

$2x > 8$ $\quad 2x < 2$

$x > 4$ $\quad x < 1$

$x > 4$ or $x < 1$



$(-\infty, 1) \cup (4, \infty)$

$\{ x \mid x < 1 \text{ or } x > 4 \}$.