Today:

Wrapping up 3-4 & starting 4-1

HW will be due Monday.

Test on Friday { • need calculator
• permitted 1 sheet of notes (double-sided)

Review session today: BH 209, 12PM-1PM

(Old HW's are in my office.)

I'll be in my all day except a meeting from 3PM to 4PM. I will be out of my office the majority of tomorrow.

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If you have a \$1,000 credit card balance and you starting paying it down \$50/month. At 9% APR (monthly comp.), how long would it take to pay off the the credit card balance?

$r = 0.09$ $\quad i = r/12 = 0.0075$

$PMT = 50$ $\quad 1000 = PV = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$

$n = \#$ months $\quad$ Solve for $n$.

$$1000 = 50\left(\frac{1-(1.0075)^{-n}}{0.0075}\right)$$

$$\frac{1000}{50} = 20 = \frac{1-(1.0075)^{-n}}{0.0075}$$

$$0.15 = 1-(1.0075)^{-n}$$

$$-0.85 = -((1.0075)^{-n})$$

$$0.85 = 1.0075^{-n}$$

$$\ln(0.85) = \ln(1.0075^{-n})$$

$$\ln(0.85) = -n\ln(1.0075)$$

$$\frac{\ln(0.85)}{\ln(1.0075)} = -n$$

$$-\frac{\ln(0.85)}{\ln(1.0075)} = n = \boxed{21.75\ldots \text{ months}}$$

It takes 22 months to pay off the debt.

It takes a lot longer if PMT = \$10:

186 months! (Even though $\frac{1000}{10} = 100 < 186$; that's the effect of interest.)

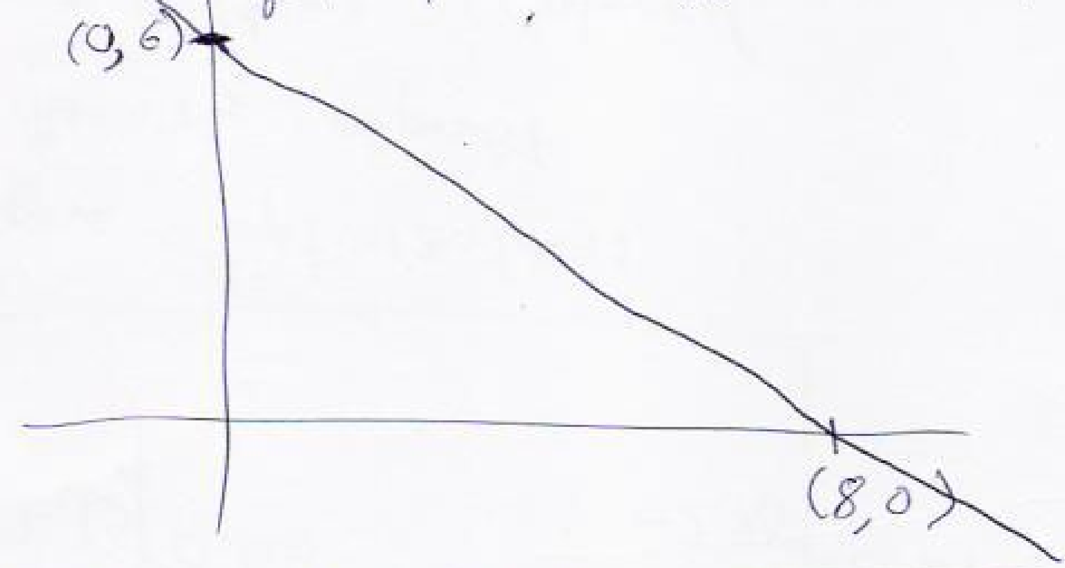
# 4-1. Systems of 2 linear equations (with 2 variables).

Each equation describes a line.

$$3x + 4y = 24$$

Plug in $x=0$: $4y = 24 \Rightarrow y = 6$

Plug in $y=0$: $3x = 24 \Rightarrow x = 8$




2 equations $\Leftrightarrow$ 2 lines

[independent &] ← not parallel

[consistent] ← at least 1 solution (the lines intersect)

dependent & consistent: 2 lines coinciding

dependent & inconsistent:

2 parallel lines
not coinciding

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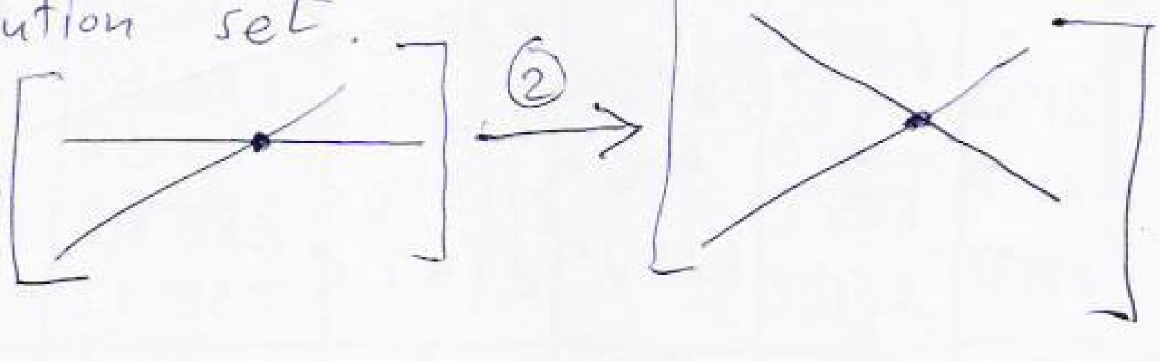
In practice, we work with equations directly:

$$\begin{bmatrix} 37x + 5y = 500 \\ 57x + 65y = 1200 \end{bmatrix}$$

3 "legal moves":

1. Multiply an equation by a nonzero number.
2. Add a multiple of one equation to another eq.
3. Swap two equations.

These moves do not change the solution set.



"Baby Gaussian Elimination"

Make the upper left coefficient (37) become 1 by multiplying the top equation by $\cancel{1}/37$:

$$\begin{bmatrix} 1x + \frac{5}{37}y = \frac{500}{37} \\ 57x + 65y = 1200 \end{bmatrix}$$

Make the lower left coefficient (57) become 0 by subtracting 57 times the first equation from the second equation. (Same as adding $-57*$top to bottom.)

$$-57*\text{top} = \left(-57x - \frac{285}{37}y = \frac{28500}{37}\right)$$

$$+\ \text{bottom} = \left(57x + 65y = 1200\right)$$

$$\left(0 + \frac{2120}{37}y = \frac{15900}{37}\right)$$

$$\begin{bmatrix} 1x + \frac{5}{37}y = \frac{500}{37} \\ 0x + \frac{2120}{37}y = \frac{15900}{37} \end{bmatrix}$$

Make middle ~~top~~ bottom coefficient $\left(\frac{2120}{37}\right)$ become 1 by multiplying the bottom by $\frac{37}{2120}$.

$$\begin{bmatrix} 1x + \frac{5}{37}y = \frac{500}{37} \\ 0x + 1y = \frac{15}{2} \end{bmatrix}$$

$\frac{15}{2} = \frac{37}{2120} \cdot \frac{15900}{37}$

Make middle top coeff. $\left(\frac{5}{37}\right)$ become 0 by subtracting $\frac{5}{37}$ * bottom from the top eq.

$$\begin{bmatrix} 1x + 0y = \frac{25}{2} \\ 0x + 1y = \frac{15}{2} \end{bmatrix}$$

$\frac{25}{2} = \frac{500}{37} - \frac{5}{37} \cdot \frac{15}{2}$

$x = \frac{25}{2}$ & $y = \frac{15}{2}$

HW: repeat with

$$2x + 3y = 10$$
$$4x - y = 6$$

(due Monday)

Steps:

? $\boxed{4}$

$\boxed{1}$

$$\begin{aligned} \#x + \#y &= \# \\ \#x + \#y &= \# \end{aligned} \Rightarrow \begin{aligned} 1x + 0x &= \# \\ 0x + 1y &= \# \end{aligned}$$

$\boxed{2}$ $\boxed{3}$