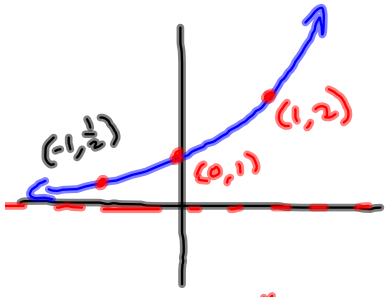


$f(x) = 2^x$

$g(x) = -4 \cdot 2^{x+1} + 5$

$2^x \longrightarrow -4 \cdot 2^x \longrightarrow -4 \cdot 2^{x+1} \longrightarrow -4 \cdot 2^{x+1} + 5$

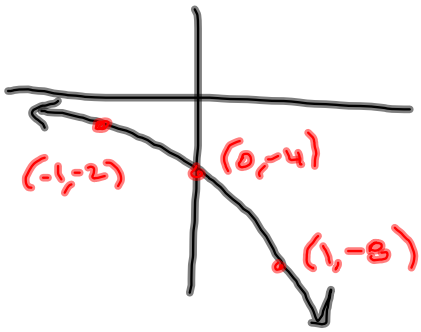
$(-1, \frac{1}{2}) \longrightarrow (-1, -2) \longrightarrow (-2, -2) \longrightarrow (-2, 3)$

$(0, 1) \longrightarrow (0, -4) \longrightarrow (-1, -4) \longrightarrow (-1, 1)$

$(1, 2) \longrightarrow (1, -8) \longrightarrow (0, -8) \longrightarrow (0, -3)$

	-4 times y	left 1	up 5
$f(x)$	$-4f(x)$	$-4f(x+1)$	$-4f(x+1)+5$

Vertical Flip times 4



etc.

Friday: Kalista will run class Friday.

Group work — word problems 5.1, 5.2, 6.1 → matrix.

Systems of nonlinear equations (5.3)

TAKE YOUR TIME: Be systematic → Left to right, Top to bottom

1. Eliminate x in E2 & E3 using E1
2. Eliminate y in E3 using E2.

#11 E1 $x + y + z = 6$
E2 $2x - 2y - z = -5$
E3 $3x + y - z = 2$

$-2E1 + E2$:

$-2E1 \quad -2x - 2y - 2z = -12$
$E2 \quad 2x - 2y - z = -5$
$-4y - 3z = -17$

$-3E1 + E3$

$-3E1 \quad -3x - 3y - 3z = -18$
$E3 \quad 3x + y - z = 2$
$-2y - 4z = -16$
$\div -2$: $y + 2z = 8$

New:

$x + y + z = 6$
$-4y - 3z = -17$
$y + 2z = 8$

we like 1's

Row swap

Improved

$x + y + z = 6$
$y + 2z = 8$
$-4y - 3z = -17$

$4E2 + E3$

$4y + 8z = 32$
$-4y - 3z = -17$
$5z = 15$
$z = 3$

NEW:

$x + y + z = 6$
$y + 2z = 8$
$z = 3$

Back-substitute:

$y + 2(3) = 8$
$y + 6 = 8$
$y = 2$

$x + 2 + 3 = 6$
$x + 5 = 6$
$x = 1$

A set containing a single ordered triple.

$\{(1, 2, 3)\}$
3-tuple

Check

$(1, 2, 3, 4)$ 4-tuple
$(1, 2, 3, 4, 5)$ 5-tuple
$(1, 2, 3, \ldots, m)$ ordered m-tuple

S6.1 Take has augmented coefficient matrix.

#11
$$\begin{aligned} x + y + z &= 6 \\ 2x - 2y - z &= -5 \\ 3x + y - z &= 2 \end{aligned}$$

$$\begin{matrix} R1 \\ R2 \\ R3 \end{matrix}\left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 2 & -2 & -1 & -5 \\ 3 & 1 & -1 & 2 \end{array}\right] \begin{matrix} R1 \\ -2R1+R2 \\ -3R1+R3 \end{matrix} \left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & -4 & -3 & -17 \\ 0 & 1 & 2 & 8 \end{array}\right]$$

Scratch:

$-2R1$:	-2	-2	-2	-12
$R2$:	2	-2	-1	-5
	0	-4	-3	-17

$-3R1$	-3	-3	-3	-18
$R3$	3	1	-1	2
	0	-2	-4	-16

INDEPENDENT
CONSISTENT

$\div -2 \sim$ $0 \quad 1 \quad 2 \quad 8$

$$R2 \leftrightarrow R3 \left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & 1 & 2 & 8 \\ 0 & -4 & -3 & -17 \end{array}\right] \begin{matrix} R1 \\ R2 \\ 4R2+R3 \end{matrix} \left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & 1 & 2 & 8 \\ 0 & 0 & 5 & 15 \end{array}\right]$$

etc. Compare to previous way

$$\begin{matrix} R1 \\ R2 \\ \frac{1}{5}R3 \end{matrix}\left[\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & 1 & 2 & 8 \\ 0 & 0 & 1 & 3 \end{array}\right]$$

etc.

Triangular on Left-hand side "Row-echelon form."

DEPENDENT CONSISTENT as "triangular" as this one gets

$2x - y + z = 7$

$y + z = 5$

This could happen with a system like

$2x - y + z = 7$

$y + z = 5$

$3y + 3z = 15$

$-3E_2 + E_3$

blah blah blah, gives me:

$2x - y + z = 7$

$y + z = 5$

$0 = 0$

Vacuous Truth.

How to write up the solution?

CONVENTION:

Let z be free! x & y will depend on z.

$y + z = 5$

$y = -z + 5$

$2x - y + z = 7$

$2x - (-z + 5) + z = 7$

$2x + z - 5 + z = 7$

$2x + 2z - 5 = 7$

$2x + 2z = 12$

$x + z = 6$

$x = -z + 6$

z = Any real #!

Solution Set:

$\{(-z+6, -z+5, z) \mid z \in \mathbb{R}\}$

$= \{(x, y, z) \mid x = -z+6, y = -z+5, z \in \mathbb{R}\}$ General Solution

Do NOT say "z is all reals"

"z is any real #" is OK.

For a particular solution, let z = a particular value.

$z = 0 \Rightarrow x = 6, y = 5$, so $(6, 5, 0)$ is a particular solution.

Solution set, here, is a line

Apr 6-9:37 AM

$$\begin{aligned} 2x - y + z &= 7 \\ y + z &= 5 \\ 3y + 3z &= 17 \end{aligned}$$

$-3E2 + E3$:

$$\begin{aligned} -3E2 \quad & -3y - 3z = -15 \\ E3 \quad & 3y + 3z = 17 \\ \hline & 0 = 2 \; !? \end{aligned}$$

This falsehood contradicts the assumption that the system has a solution.

No Sol'n

DEPENDENT / INCONSISTENT

§5.3 Pre-prob:

$5x - y = 6$

$y = x^2$

$5x - y = 6$

$5x - x^2 = 6$

$-x^2 + 5x - 6 = 0$

$x^2 - 5x + 6 = 0$

$(x-3)(x-2) = 0$

$x \in \{2, 3\}$