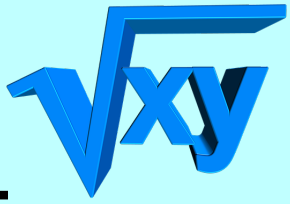
Math 115

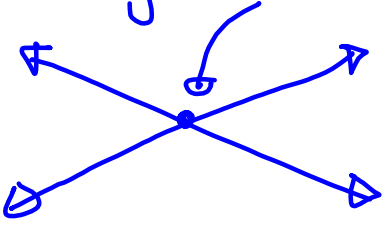
Fall 2017

Lecture 15



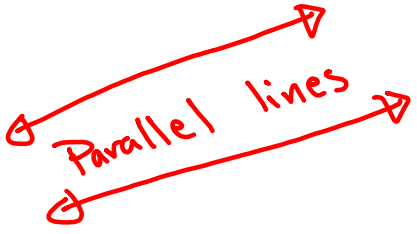
when the system of linear equations in tw variables has

a) exactly one Solution



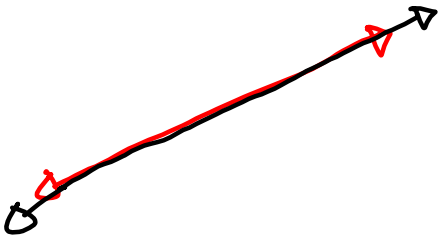
the system is consistent & Equations are independent

b) It has no Solution



The system is inconsistent but equations are independent

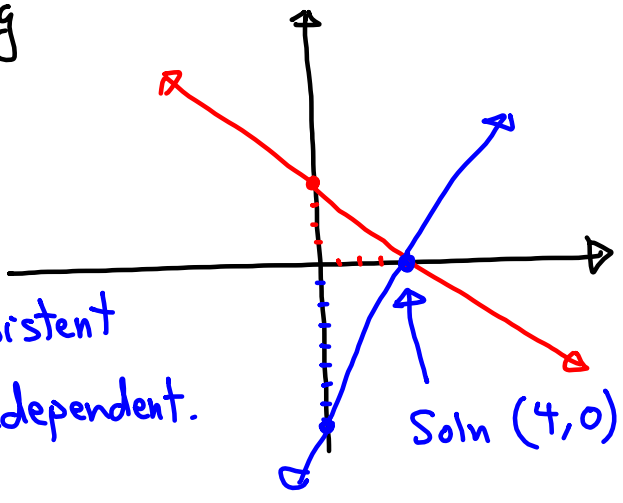
c) infinitely many Solutions



The system is Consistent and equations are dependent.

Solve by graphing

$$\begin{cases} x + y = 4 \\ 2x - y = 8 \end{cases}$$



System : Consistent

Equations : Independent.

Soln (4, 0)

Solve by Subs. method:

$$\begin{cases} 4x - y = 7 \\ y = 4x + 7 \end{cases}$$

$4x - (4x + 7) = 7$

$4x - 4x - 7 = 7$

$-7 = 7$

False

No Solution

System: Inconsistent

Eqns: Independent

Solve by addition / Elimination

$$3\begin{cases} \frac{x}{3} - y = 2 \\ 2\left(\frac{-x}{2} + \frac{3y}{2} = -3\right) \end{cases}$$

$$\begin{cases} x - 3y = 6 \\ -x + 3y = -6 \end{cases}$$

$0 = 0$ → True

infinitely many Solns.

System: consistent

Eqns: Dependent.

SG 11 Due Tuesday

whenever you have fractions, use LCD to clear them.

Ch. 4 Exponential Rules

1) x^n ← Exponent, x ↳ base

$$x^n = \underbrace{x \cdot x \cdot x \cdot \cdots \cdot x}_{n \text{ times}}$$

$$5^3 = 5 \cdot 5 \cdot 5$$

$$(-2)^5 = (-2)\cdot(-2)\cdot(-2)\cdot(-2)\cdot(-2)$$

$$\left(\frac{3}{4}\right)^4 = \frac{3}{4}\cdot\frac{3}{4}\cdot\frac{3}{4}\cdot\frac{3}{4}, \quad (7x)^2 = (7x)(7x)$$

$$(-2x^3y^4)^3 = (-2x^3y^4)(-2x^3y^4)(-2x^3y^4)$$

2) $x^1 = x$ $\quad 7^1 = 7$, $(-8)^1 = -8$

$$\left(\frac{-2}{5}\right)^1 = \frac{-2}{5}, \quad (-5x^4)^1 = -5x^4$$

3) $x^0 = 1$, $x \neq 0$ $\quad 5^0 = 1$, $(-100)^0 = 1$

$$(2017)^0 = 1, \quad \left(\frac{4}{7}\right)^0 = 1$$

$$(-4x^6)^0 = 1, \quad x \neq 0$$

4) $x^m \cdot x^n = x^{m+n}$

$x^4 \cdot x^2 = x^{4+2} = x^6$

$x^8 \cdot x^5 \cdot x^7 = x^{8+5+7}$

$= x^{20}$

$(10x^4)^{12} \cdot (10x^4)^{18} = (10x^4)^{12+18}$

$= (10x^4)^{30}$

5) $(x^m)^n = x^{m \cdot n}$

$(x^4)^5 = x^{4 \cdot 5} = x^{20}$

$(x^8)^7 = x^{8 \cdot 7} = x^{56}$

$(x^{10})^3 \cdot (x^7)^5 = x^{30} \cdot x^{35} = x^{30+35} = \boxed{x^{65}}$

6) $(xy)^n = x^n y^n$

$(2x)^5 = 2^5 \cdot x^5$

$= 32x^5$

$(-3x^2)^4 = (-3)^4 (x^2)^4$

$= 81x^8$

$(-5x^3y^{10})^3 = (-5)^3 (x^3)^3 (y^{10})^3$

$= \boxed{-125x^9y^{30}}$

$(-5)(-5)(-5)$

7) $\frac{x^m}{x^n} = x^{m-n}$

$\frac{x^8}{x^3} = x^{8-3} = \boxed{x^5}$

$\frac{x^{21}\,y^8}{x^{20}\,y} = x^{21-20}\,y^{8-1}$

$= x^1 y^7$

$= \boxed{xy^7}$

$\frac{(x^6)^5}{(x^{10})^3} = \frac{x^{30}}{x^{30}} = x^{30-30}$

$= x^0 = 1 \; ; x \neq 0$

8) $\left(\frac{x}{y}\right)^n = \frac{x^n}{y^n}$

$\left(\frac{2}{3}\right)^4 = \frac{2^4}{3^4} = \frac{16}{81}$

$\left(\frac{-3}{5}\right)^3 = \frac{(-3)^3}{5^3} = \frac{-27}{125}$

$\left(\frac{x^5}{y^{10}}\right)^4 = \frac{(x^5)^4}{(y^{10})^4} = \frac{x^{20}}{y^{40}}$

$\left(\frac{x^2}{3y^4}\right)^2 = \frac{(x^2)^2}{(3y^4)^2}$

$= \frac{x^4}{3^2 (y^4)^2}$

$= \boxed{\frac{x^4}{9y^8}}$

Simplify $\dfrac{(x^7)^3 \cdot (y^4)^2}{x^{16} \cdot y^5} = \dfrac{x^{21} \cdot y^8}{x^{16} \cdot y^5}$

$= x^{21-16} \cdot y^{8-5}$

$= x^5 y^3$

9) $x^{-n} = \dfrac{1}{x^n}$

$x^{-3} = \boxed{\dfrac{1}{x^3}}$, $(x^{-5})^2 = x^{-10} = \boxed{\dfrac{1}{x^{10}}}$

$(x^8)^{-3} = x^{-24} = \boxed{\dfrac{1}{x^{24}}}$

10) $\dfrac{x^{-m}}{y^{-n}} = \dfrac{y^n}{x^m}$ $\quad \dfrac{x^{-3}}{y^{-10}} = \dfrac{y^{10}}{x^3}$

$\dfrac{(x^5)^{-3} y^8}{x^5 \cdot (y^{-2})^4}$

$= \dfrac{x^{-15} y^8}{x^5 y^{-8}} = \dfrac{y^8 y^8}{x^5 x^{15}}$

$= \dfrac{y^{16}}{x^{20}}$

$\dfrac{x^{-2} y^7}{x^{12} y^{-3}} = \dfrac{y^3 y^7}{x^{12} x^2}$

$= \dfrac{y^{10}}{x^{14}}$

11) $\left(\frac{x}{y}\right)^{-n} = \left(\frac{y}{x}\right)^{n}$

$\left(\frac{1}{2}\right)^{-3} = \left(\frac{2}{1}\right)^{3} = 2^3 = \boxed{8}$

$\left(\frac{4}{x^2}\right)^{-2} = \left(\frac{x^2}{4}\right)^{2} = \frac{(x^2)^2}{4^2} = \frac{x^4}{16}$

$\left(\frac{y^5}{x^8}\right)^{-4} = \left(\frac{x^8}{y^5}\right)^{4} = \frac{(x^8)^4}{(y^5)^4} = \boxed{\frac{x^{32}}{y^{20}}}$