# Appendix C (Systems of Equations & Inequalities; and Partial Fraction Decomposition (PFD))

System of Linear Equations

a set of linear eqns to be "solved" simultaneously (we're looking for the point(s) where the lines/planes intersect)

in **2-d**:

①
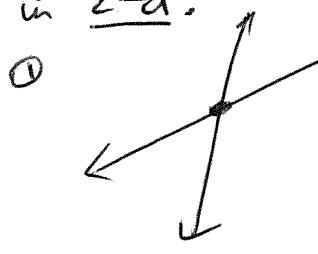
consistent
one solution

②
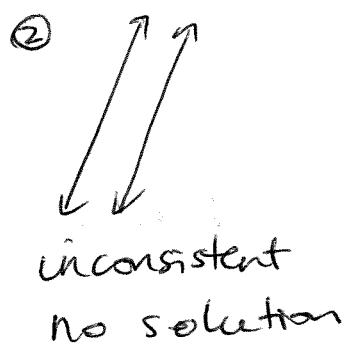
inconsistent
no solution

③
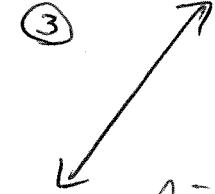
(same lines)
consistent
all pts on the line are solutions

Strategies to Solve system of Linear Eqns:

① Graphing

unreliable for fraction values of x and y

② Substitution

Great and useful for systems of any type of eqns (not just linear)

③ Elimination

Fast and great for linear systems

App C (cont)

Ex1 Solve these systems of eqns.

(a) (use substitution)

$$2x + 10y = -22$$
$$3x - 14y = 30$$

(b) (use elimination)

$$3x + 2y = 17$$
$$-5x + 3y = 16$$

Ex2 Solve this system of 3 eqns.

$$2x + y - 2z = 1$$
$$x + 3y + z = 2$$
$$3x + 4y - z = 5$$

Ex 3   Solve these systems of equs.

(a) $3x - 4y = 5$
      $-6x + 8y = 10$

(b) $x = 2y - 7$
      $5x - 1 = 10y$

Solving a system of linear inequalities   (in 2-d)

Strategy: ① graph the lines

② shade in the appropriate half-plane
for each line   (pick a test pt)

③ keep the intersection of all regions
shaded in ②

Ex 4 Solve this system of linear inequalities.

$$3y - 2x \geq -6$$

$$2x + 5y \leq 10$$

$$6x + 3y \geq -6$$
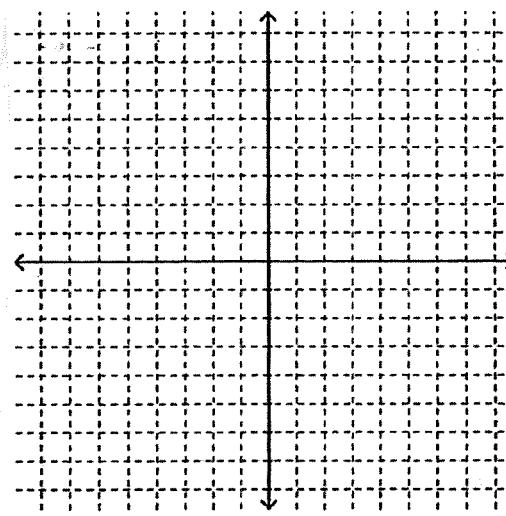
Partial Fraction Decomposition

$P(x) = $ a polynomial of x

$$\frac{P(x)}{(x-a)^n (x-b)^m (x^2+c)^k} = \frac{A_1}{x-a} + \frac{A_2}{(x-a)^2} + \cdots + \frac{A_n}{(x-a)^n} + \frac{B_1}{x-b} + \frac{B_2}{(x-b)^2} + \cdots + \frac{B_m}{(x-b)^m}$$

$$+ \frac{C_1 x + D_1}{(x^2+c)} + \frac{C_2 x + D_2}{(x^2+c)^2} + \cdots + \frac{C_k x + D_k}{(x^2+c)^k}$$

decomposition of LHS

__Ex 5__ Find the partial fraction decomposition (PFD) for this rational expressions.

$$\frac{x-9}{x^2-3x-18}$$

Strategy:
① set up PFD eqn
② multiply both sides by original denominator
③ Solve for A, B, S etc. by:

(a) equate coefficients of like terms

__OR__
(b) plugging in values of x

137
M1080

App C (cont)

Ex6   Find PFD

(a) $\dfrac{16x^2}{(x-6)(x+2)^2}$

(b) $\dfrac{20x}{(x-1)^2(x^2+1)}$

Ex 7 Solve this system of eqns.

$$x + 3y = 0$$
$$x^2 + y^2 = 40$$