HW pg. 445 71-75 odd
81, 85, 87, 91 101

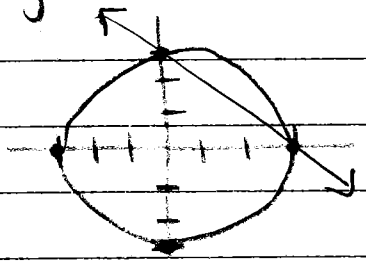
7.1 Systems of Equations (Day 2)

Open Solve the system by graphing w/o calc

$x^2+y^2=9$ ⇒ circle with radius of 3

$x+y=3$ ⇒ line $y=-x+3$

Slope $=-1$ y-int $=(0,3)$



Solutions = intersections

$\boxed{(3,0)\ (0,3)}$

Solving systems analytically - use any method
Graph, substitution, elimination

Example 1 Solve analytically

(A) $x^2+y^2=9$
$x+y=3$

* cannot use elimination
* used graphing in opener

Substitution: $x^2+\boxed{y}^2=9$

$x+y=3 \longrightarrow y=\boxed{-x+3}$

$x^2+(-x+3)^2=9$

$x^2+x^2-6x+9=9$

$2x^2-6x=0$

$2x(x-3)=0$

$2x=0 \quad x-3=0$

$x=0 \quad x=3$

→ Substitute back in:

$y=-x+3$

$x=0$: $y=-0+3$, $y=3$, $\boxed{(0,3)}$

$x=3$: $y=-3+3$, $y=0$, $\boxed{(3,0)}$

(2) $x^2 + y^2 = 4$
$2x^2 - 3y^2 = -12$ $\Rightarrow$ Can use substitution, elimination or graphing

Substitution

$x^2 + y^2 = 4$
$y^2 = -x^2 + 4$

$2x^2 - 3y^2 = -12$
$2x^2 - 3(-x^2 + 4) = -12$
$2x^2 + 3x^2 - 12 = -12$
$5x^2 = 0$
$x^2 = 0$
$x = 0$

Substitute $x = 0$
$y^2 = -x^2 + 4$
$y^2 = 0 + 4$
$y^2 = 4$
$y = \pm 2$
$(0, 2)$ $(0, -2)$

Solution: $(0,2)$ $(0,-2)$

Elimination

$x^2 + y^2 = 4$
$2x^2 - 3y^2 = -12$ $\Rightarrow$ $3(x^2 + y^2 = 4)$
$2x^2 - 3y^2 = -12$ $\Rightarrow$ $3x^2 + 3y^2 = 12$
$2x^2 - 3y^2 = -12$
$5x^2 = 0$
$x^2 = 0$
$x = 0$

Substitute $x = 0$
$x^2 + y^2 = 4$
$0 + y^2 = 4$
$y^2 = 4$
$y = \pm 2$

Solution: $(0,2)$ $(0,-2)$

Graphing w/o Calculator

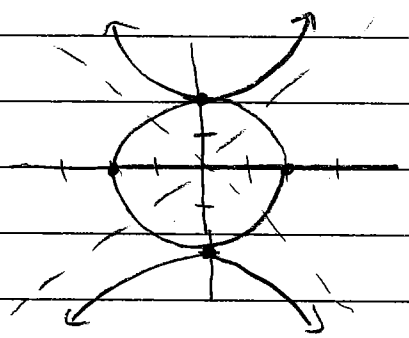
$x^2 + y^2 = 4$ Circle: $r = 2$

$\frac{2x^2}{-12} - \frac{3y^2}{-12} = \frac{-12}{-12}$ hyperbola

$-\frac{x^2}{6} + \frac{y^2}{4} = 1$

$\frac{y^2}{4} - \frac{x^2}{6} = 1$

$\sqrt{6} \approx 2.4$



Solutions: $(0,2)$ $(0,-2)$

7.1 (Day 2 cont'd)

Graphing Calculator Solve the system:

$y = \sqrt[3]{x-4}$

$x^2+y^2=6 \Longrightarrow$ need to solve for y

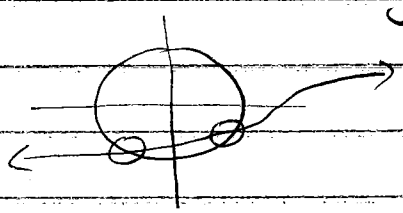
$\sqrt{y^2} = \sqrt{-x^2+6}$

$y = \pm\sqrt{-x^2+6}$

Calculator: $y_1 = \sqrt[3]{x-4}$

$y_2 = \sqrt{-x^2+6}$

$y_3 = -\sqrt{-x^2+6}$



2nd CALC intersect

first curve? second curve? guess?

* second curve does not intersect

$y_2 = \sqrt{-x^2+6}$

Change y_2 to $-\sqrt{-x^2+6}$

Intersections are solutions: $(-1.678, -1.784)$ $(2.115, -1.235)$

Hw (85) x = robberies in 2000 y = robberies in 2001

(a) System: $x+y = 831{,}000$

$x-y = 15{,}000$

(b) $x+y = 831{,}000$

$\underline{x-y = 15{,}000}$

$\frac{2x}{2} = \frac{846{,}000}{2}$

$x = 423000$

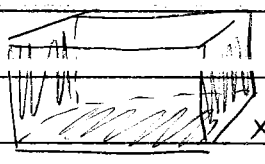
$x+y = 831000$

$423000+y = 831000$

$y = 408{,}000$

(c) There were 423,000 robberies in 2000 and 408,000 robberies in 2001.

X

(89) 

V = l · w · h

$588 = 2x \cdot x \cdot y$

$588 = 2x^2 y$

SA = 2(lw + lh + wh)

$= 2(2x \cdot x + xy + 2xy)$

$= 4x^2 + 2xy + 4xy$

$448 = 4x^2 + 6xy$

System: $2x^2 y = 588 \Rightarrow y = \boxed{\frac{588}{2x^2}}$

$4x^2 + 6xy = 448$

$4x^2 + 6x\left(\frac{588}{2x^2}\right) = 448$

$4x^2 + \frac{3528x}{2x^2} = 448$

$x\left(4x^2 + \frac{1764}{x} = 448\right)$

$4x^3 + 1764 = 448x$

$\frac{4x^3 - 448x + 1764 = 0}{4}$

$x^3 - 112x + 441 = 0$

Graphing Calculator - Solutions are x-intercepts