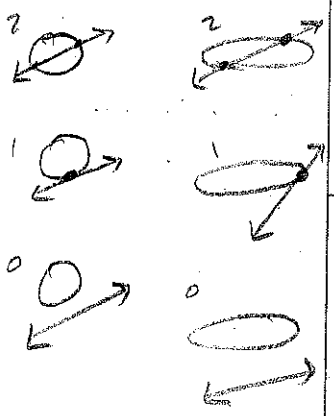
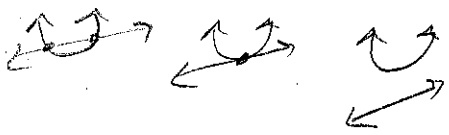
LINEAR & QUADRATIC SYSTEMS

In how many ways can a quadratic & a line intersect?

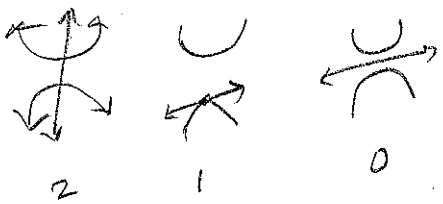
a line and a circle or a line and an ellipse ...



a line and a parabola ...



a line and a hyperbola ...



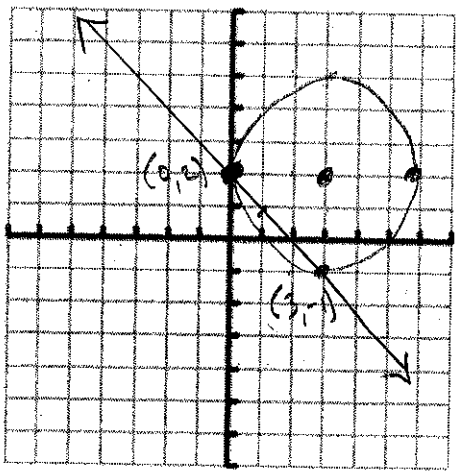
SOLVE BY GRAPHING:

$$\begin{cases} (x-3)^2+(y-2)^2=9 \\ x+y=2 \end{cases}$$

Center $(3,2)$ $r=3$

$y=-x+2$

$m=-\frac{1}{1}$



Solutions

$(0,2)$ $(3,-1)$

SOLVE ALGEBRAICALLY: use substitution method

$$\begin{cases} x^2 + y^2 + 4x = 0 \\ y - x = 4 \implies y = x + 4 \end{cases}$$

$x^2 + (x+4)^2 + 4x = 0$

$x^2 + (x+4)(x+4) + 4x = 0$

$x^2 + x^2 + 8x + 16 + 4x = 0$

$2x^2 + 12x + 16 = 0$

$x^2 + 6x + 8 = 0$

$(x+2)(x+4) = 0$

$x = -2$ | $x = -4$

$y = -2 + 4$ | $y = -4 + 4$

$y = 2$ | $y = 0$

$(-2, 2)$ | $(-4, 0)$

2 solutions

SOLVE ALGEBRAICALLY:

$$\begin{cases} 3x + y^2 + 2 = 0 \\ 3x = y - 2 \implies y = 3x + 2 \end{cases}$$

$3x + (3x+2)^2 + 2 = 0$

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

$3x + 9x^2 + 12x + 4 + 2 = 0$

$9x^2 + 15x + 6 = 0$

$3x^2 + 5x + 2 = 0$

$(3x+2)(x+1) = 0$

$x = -\frac{2}{3}$ | $x = -1$

$y = 3\left(-\frac{2}{3}\right) + 2$ | $y = 3(-1) + 2$

$y = 0$ | $y = -1$

$\left(-\frac{2}{3}, 0\right)$ $(-1, -1)$