Nonlinear Systems of Equations

Line: $x + 7y = 50$

Circle: $x^2 + y^2 = 100$

Isolate variable with smallest power + coeff.

$x = 50 - 7y$

$(50-7y)^2 + y^2 = 100$

FOIL!

$(50-7y)(50-7y)$

$2500 - 350y - 350y + 49y^2 + y^2 = 100$

$50y^2 - 700y + 2400 = 0$

$50(y^2 - 14y + 48) = 0$

$50(y-6)(y-8)$

$y = 6 \quad y = 8$

$x = 50 - 7y$

$y = 6 \quad x = 50 - 42 = 8$

$y = 8 \quad x = 50 - 56 = -6$

$\boxed{(8,6) \quad (-6,8)}$

Parabola

Circle

$-1[x^2 + y = 13]$

$x^2 + y^2 = 25$

$-x^2 - y = -13$

$+ x^2 + y^2 = 25$

$y^2 - y = 12$

$y^2 - y - 12 = 0$

$(y-4)(y+3) = 0$

$y = 4 \quad y = -3$

$y = 4$

$x^2 + y = 13$

$x^2 + 4 = 13$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

$(3,4) \quad (4,-3)$

$(-3,4) \quad (-4,-3)$

$y = -3$

$x^2 + -3 = 13$

$\sqrt{x^2} = \sqrt{16}$

$x = \pm 4$

$\log(x+1.1) = y+3$

$y+4 = \log(x^2)$

elim is possible

$\begin{cases} y+3 = \log(x+1.1) \\ y+4 = \log(x^2) \end{cases}$

$\log(x+1.1) - 3 = y$

$y = \log(x^2) - 4$

$\log(x+1.1) - 3 = \log(x^2) - 4$

$+4 \qquad +4$

$1 = \log(x^2) - \log(x+1.1)$

$1 = \log\left(\frac{x^2}{x+1.1}\right)$

$(x+1.1)10^1 = \frac{x^2}{x+1.1}(x+1.1)$

$10x + 11 = x^2$

$0 = x^2 - 10x - 11$

$0 = (x-11)(x+1)$

$x = 11 \quad x = -1$

$y = \log(x^2) - 4$

$x = 11 \quad y = \log_{10}121 - 4$

$x = -1 \quad y = \log 1 - 4 = 0 - 4 = -4$

$(11, \log(121) - 4) \quad (-1, -4)$

$x^2 + y^2 \leq 25$ Circle $(0,0)$ $r = \sqrt{25} = 5$

$x + 2y \leq 5$ Line

$0 + 0 \leq 5$ T

0	$5/2 = 2.5$
5	0

$\leq$ solid

$<$ dotted

$\frac{2y}{2} \leq -\frac{x}{2} + \frac{5}{2}$

$* \; y \leq -\frac{1}{2}x + \frac{5}{2}$

↑ below graph