

## Precalculus

### § Polynomial system that reduces to quadratic, part 1

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## Example

Solve the polynomial system. 
$$\begin{cases} x - 4y = 5 \\ y^2 + xy = 10 \end{cases}$$

$$x = 5 + 4y$$

Solve for  $x$  in first eq-n.

$$y^2 + xy = 10$$

Substitute  $x$  away

$$y^2 + (5 + 4y)y = 10$$

$$y^2 + 5y + 4y^2 - 10 = 0$$

$$5y^2 + 5y - 10 = 0$$

Divide by 5

$$y^2 + y - 2 = 0$$

$$(y + 2)(y - 1) = 0$$

$$y = -2 \text{ or } y = 1$$

$$x = 5 + 4y$$

$$x = 5 + 4y$$

$$= 5 + 4(-2) = -3$$

$$= 5 + 4 \cdot 1 = 9$$

Final answer:  $x = -3, y = -2$  or  $x = 9, y = 1$ .

## Example

Solve the polynomial system. 
$$\left| \begin{array}{rcl} x - 4y & = & 5 \\ y^2 + xy & = & 10 \end{array} \right.$$

Final answer:  $x = -3, y = -2$  or  $x = 9, y = 1$ .

Check answer  $x = -3, y = -2$ :

$$\left| \begin{array}{rcl} x - 4y & = & (-3) - 4(-2) = 5 \\ y^2 + xy & = & (-2)^2 + (-3)(-2) = 10 \end{array} \right.$$

Check answer  $y = 1, x = 9$ :

$$\left| \begin{array}{rcl} x - 4y & = & 9 - 4 \cdot 1 = 5 \\ y^2 + xy & = & 1^2 + 9 \cdot 1 = 10. \end{array} \right.$$