Corrigé

Feuille de travail

3.5 Les systèmes d'équations semi-linéaires

Détermine les points d'intersection des systèmes d'équations semi-linéaires.

a) $y = 5x^2 + 49$
$y = x^2 - 28x$

b) $y - 2x = 0$
$y = x^2 - 35$

c) $y = 4x$
$y = 3x^2$

d) $y = 3x^2 + 5x$
$y = 12$

e) $y = \frac{1}{4}x^2 + 2$
$3x + 2y = 0$

f) $y = 4x^2$
$y = -x^2 + 100$

g) $y = 3x^2 + 2x$
$y = 2x + 7$

a) $y = 5x^2 + 49$
$y = x^2 - 28x$

$5x^2 + 49 = x^2 - 28x$

$4x^2 + 28x + 49 = 0$

$4x^2 + 14x + 14x + 49 = 0$

$2x(2x+7) + 7(2x+7) = 0$

$(2x+7)(2x+7) = 0$

$x = -7/2$

$x = -3,5$

$14 \times 14 = 196$

$- + - = 28$

$y = \left(-\frac{7}{2}\right)^2 - 28(-7/2)$

$y = 110\ 1/4$

$y = 110,25$

$(-3,5 \ , \ 110,25)$

b) $y - 2x = 0 \Rightarrow y = 2x$
$y = x^2 - 35$

$2x = x^2 - 35$

$0 = x^2 - 2x - 35$

$0 = x^2 - 7x + 5x - 35$

$0 = x(x-7) + 5(x-7)$

$0 = (x-7)(x+5)$

$x = 7 \qquad x = -5$

$y = 2(7) \qquad y = 2(-5)$

$y = 14 \qquad y = -10$

$(7, 14) \ ; \ (-5, -10)$

c) $y = 4x$
$y = 3x^2$

$4x = 3x^2$
$0 = 3x^2 - 4x$
$0 = x(3x - 4)$

$x = 0$ $\quad x = 4/3$
$y = 4(0)$ $\quad y = 4(4/3)$
$y = 0$ $\quad y = 16/3$
$(0,0)$; $(4/3, 16/3)$

d) $y = 3x^2 + 5x$
$y = 12$

$3x^2 + 5x = 12$
$3x^2 + 5x - 12 = 0$
$3x^2 - 4x + 9x - 12 = 0$
$x(3x - 4) + 3(3x - 4) = 0$
$(3x - 4)(x + 3) = 0$

$x = 4/3$ $\quad x = -3$
$y = 12$ $\quad y = 12$
$(4/3, 12)$ $\quad (-3, 12)$

$9x - 4 = -36$
$- + - = 5$

e) $y = 1/4x^2 + 2$
$0 = 3x + 2y \Rightarrow y = -\frac{3}{2}x$

$-\frac{3}{2}x \cdot 4 = \frac{1}{4}x^2 \cdot 4 + 2 \cdot 4$
$-6x = x^2 + 8$
$0 = x^2 + 6x + 8$
$0 = x^2 + 4x + 2x + 8$
$0 = x(x + 4) + 2(x + 4)$
$0 = (x + 4)(x + 2)$

$x = -4$ $\quad x = -2$
$y = -\frac{3}{2}(-4)$ $\quad y = -\frac{3}{2}(-2)$
$y = 6$ $\quad y = 3$
$(-4, 6)$; $(-2, 3)$

F) $y = 4x^2$

$y = -x^2 + 100$

$4x^2 = -x^2 + 100$

$5x^2 = 100$

$x^2 = 20$

$x = \pm\sqrt{20}$

$x = \pm 2\sqrt{5}$ ou $x = \pm 4,47$

$y = 4(-4,47)^2$ $y = 4(4,47)^2$

$y = 80$ $y = 80$

$(4,47, 80)$; $(4,47, 80)$

g) $y = 3x^2 + 2x$

$y = 2x + 7$

$3x^2 + 2x = 2x + 7$

$3x^2 = 7$

$x^2 = \frac{7}{3}$

$\sqrt{x^2} = \pm\sqrt{\frac{7}{3}}$

$x = \pm\frac{\sqrt{7}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

$x = \pm\frac{\sqrt{21}}{3}$

$y = 2\frac{\sqrt{21}}{3} + 7$ $y = 2\left(-\frac{\sqrt{21}}{3}\right) + 7$

$y = -\frac{2\sqrt{21}}{3} + 7$

$\left(\frac{\sqrt{21}}{3}, \frac{2\sqrt{21}}{3} + 7\right)$ $\left(-\frac{\sqrt{21}}{3}, -\frac{2\sqrt{21}}{3} + 7\right)$

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

$y = \frac{x^2}{2} - 5 \Rightarrow 2y = x^2 - 10 \Rightarrow x^2 = 2y + 10$

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

$$2y + 10 + y^2 = 25$$

$$y^2 + 2y - 15 = 0$$

$$y^2 - 3y + 5y - 15 = 0$$

$$y(y-3) + 5(y-3) = 0$$

$$(y-3)(y+5) = 0$$

$y = 3 \quad y = -5$

$x^2 = 2(3) + 10 \quad x^2 = 2(-5) + 10$

$x^2 = 16 \quad x^2 = 0$

$x = \pm 4 \quad x = 0$

$(3, 4) \quad (3, -4) \quad (-5, 0)$