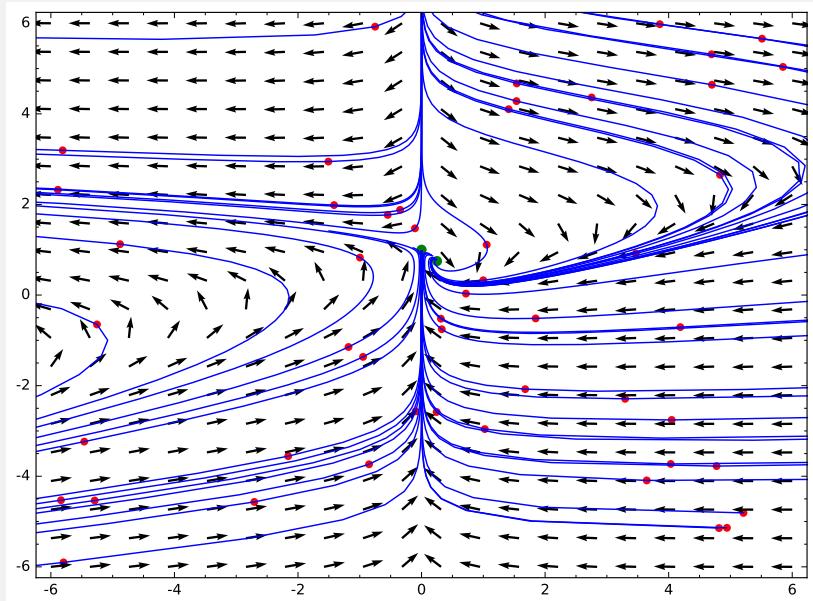


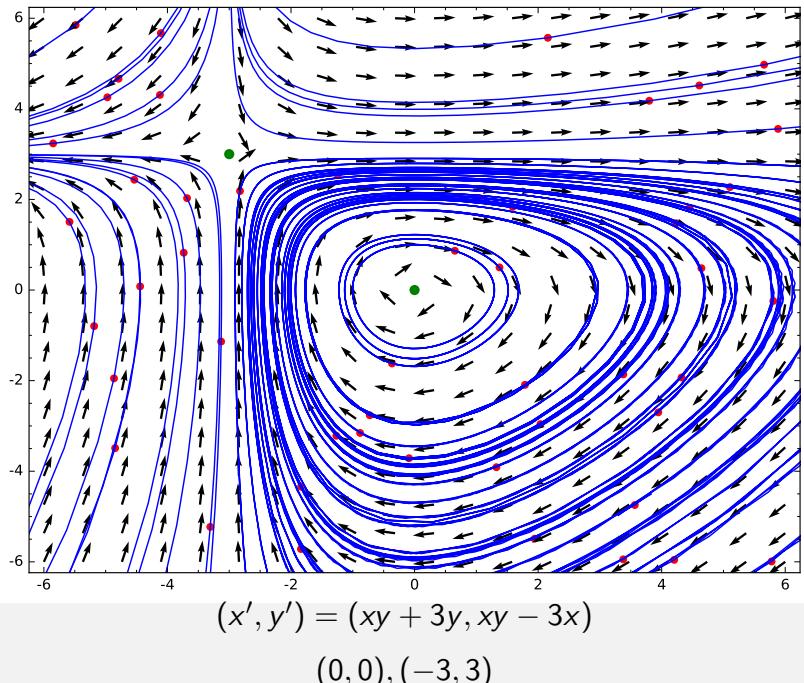
Portraits de phase pour des systèmes non linéaires autonomes

$$(x', y') = f(x, y)$$

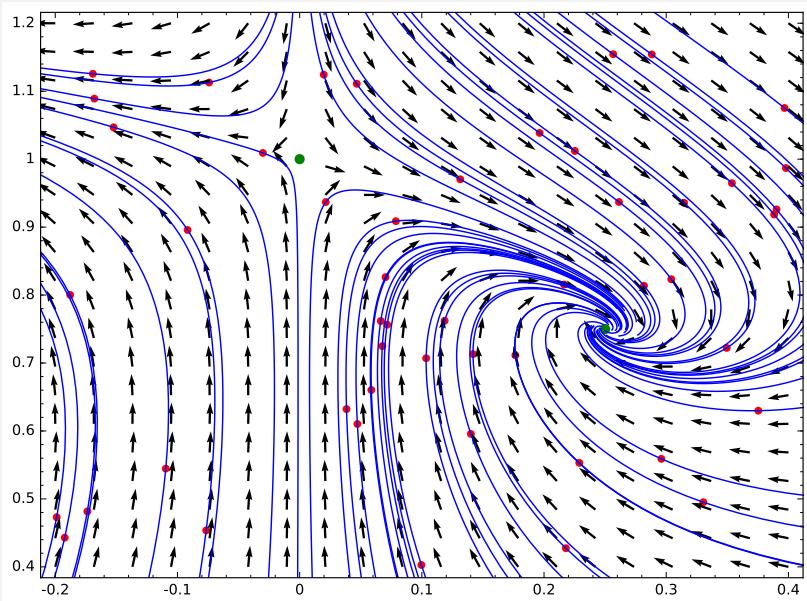
au voisinage des points d'équilibre.



$$(1/4, 3/4), (0, 1)$$

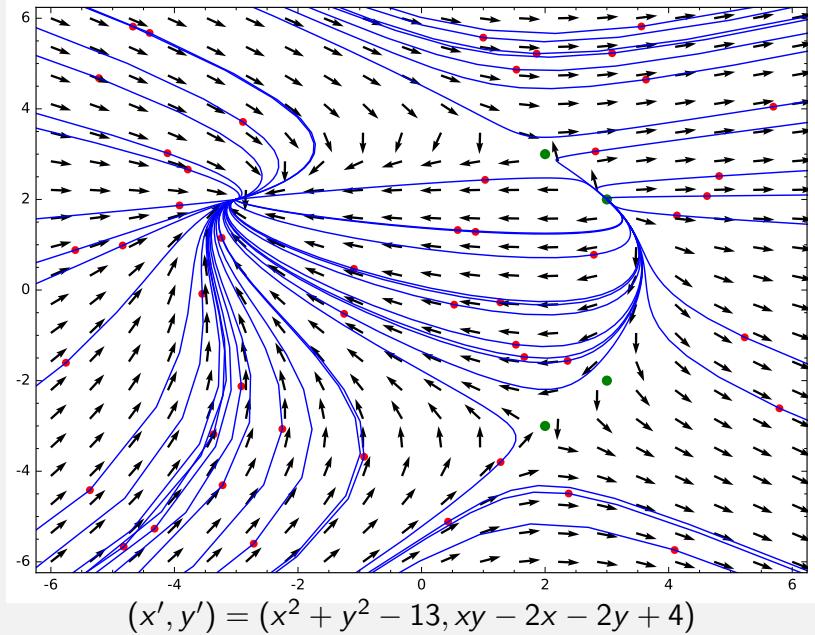


$$(0, 0), (-3, 3)$$



$$(1/4, 3/4)$$

$$(0, 1)$$



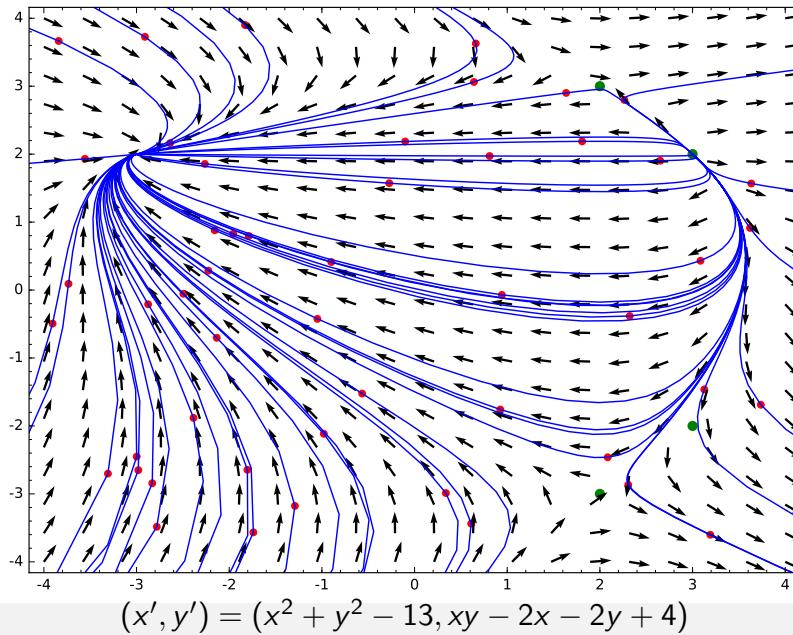
$$(x', y') = (x^2 + y^2 - 13, xy - 2x - 2y + 4)$$

$$(2, \pm 3), (\pm 3, 2)$$

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Laurent Guillopé

Systèmes dynamiques : 9 novembre



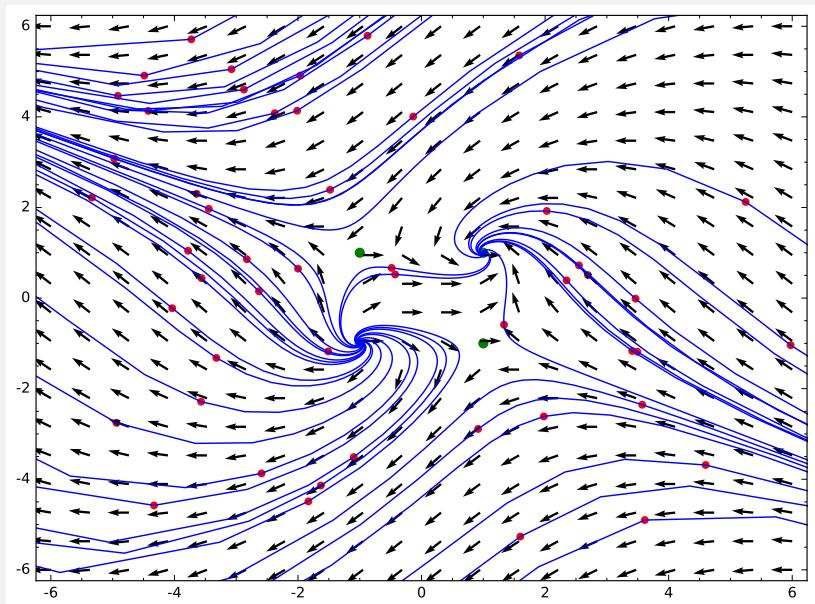
$$(x', y') = (x^2 + y^2 - 13, xy - 2x - 2y + 4)$$

$$(2, \pm 3), (\pm 3, 2)$$

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Laurent Guillopé

Systèmes dynamiques : 9 novembre



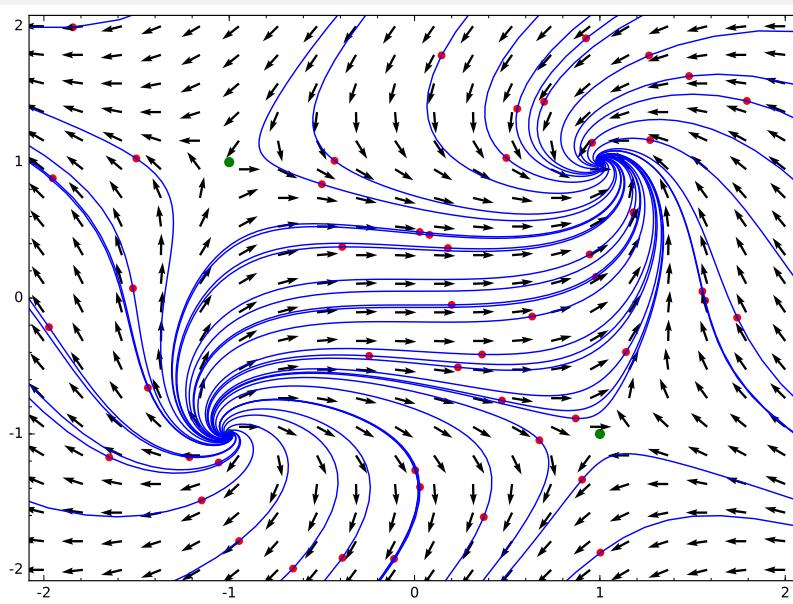
$$(x', y') = (2 - x^2 - y^2, x^2 - y^2)$$

$$(\pm 1, \pm 1)$$

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Laurent Guillopé

Systèmes dynamiques : 9 novembre



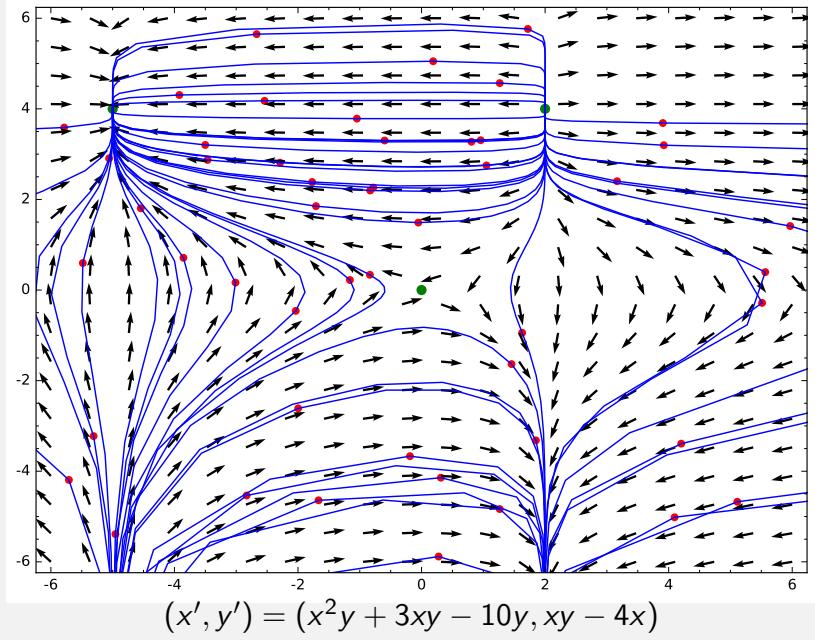
$$(x', y') = (2 - x^2 - y^2, x^2 - y^2)$$

$$(\pm 1, \pm 1)$$

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Laurent Guillopé

Systèmes dynamiques : 9 novembre



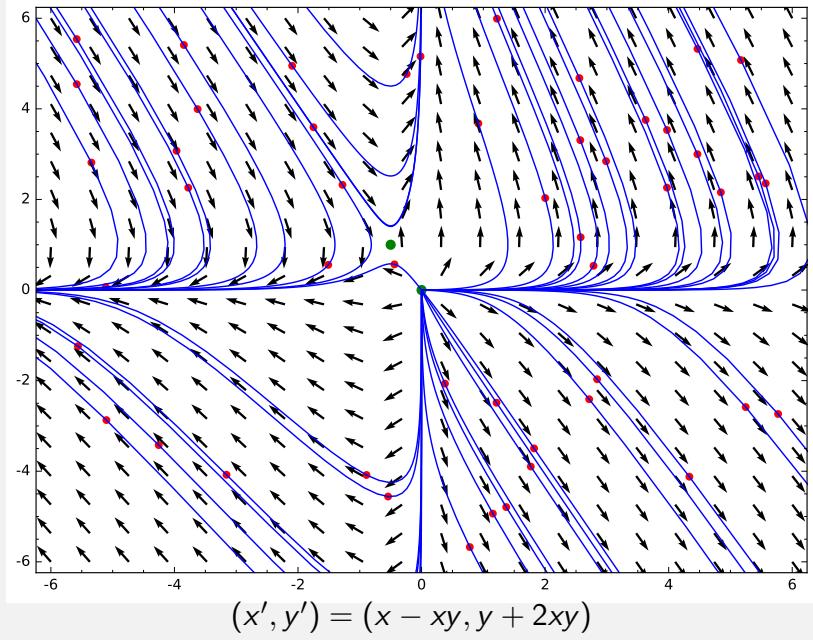
$$(x', y') = (x^2y + 3xy - 10y, xy - 4x)$$

$$(0,0), (-5,4), (2,4)$$

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Laurent Guillopé

Systèmes dynamiques : 9 novembre



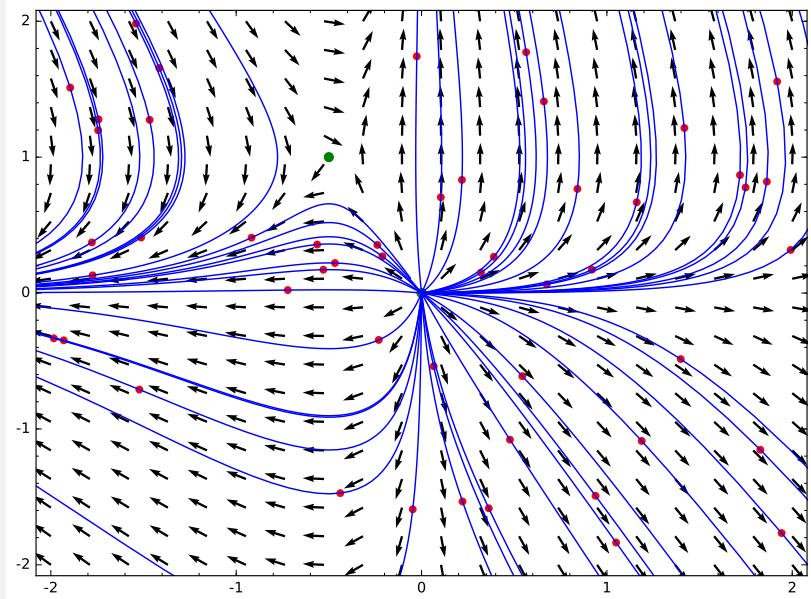
$$(x', y') = (x - xy, y + 2xy)$$

$$(0,0), (-0.5,1)$$

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Laurent Guillopé

Systèmes dynamiques : 9 novembre



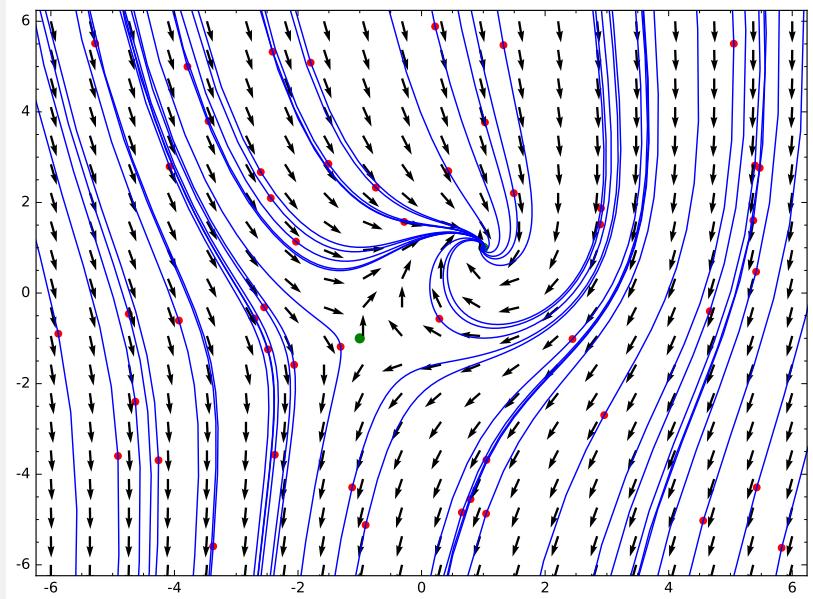
$$(x', y') = (x - xy, y + 2xy)$$

$$(0,0), (-0.5,1)$$

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Systèmes dynamiques : 9 novembre



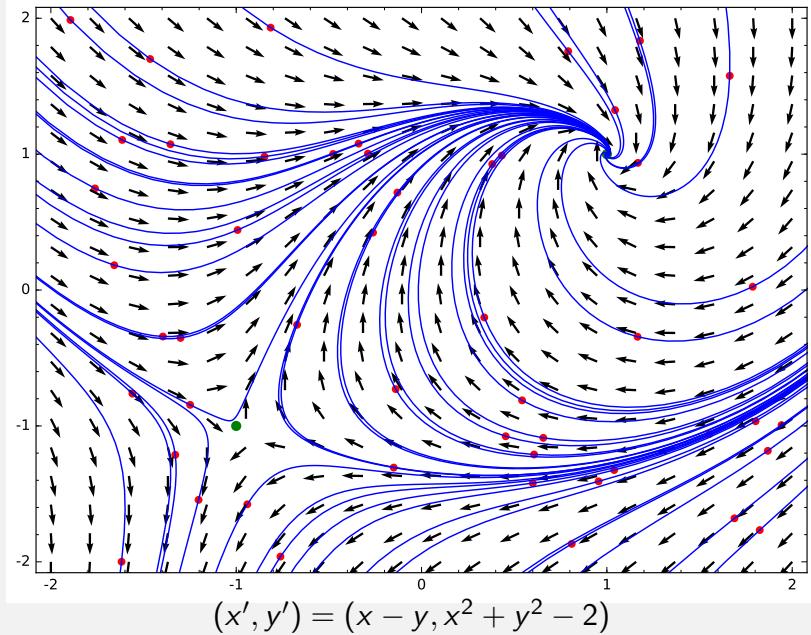
$$(x', y') = (x - y, x^2 + y^2 - 2)$$

$$\pm(1,1)$$

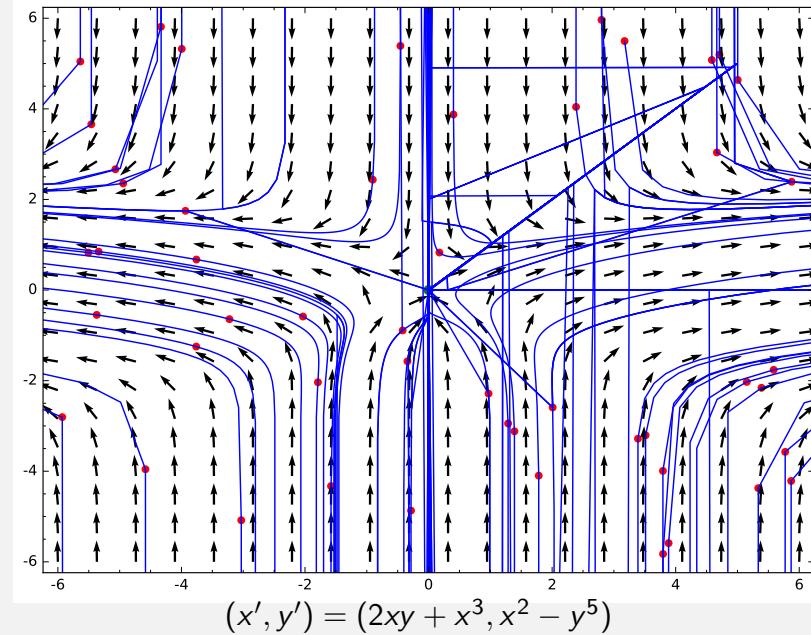
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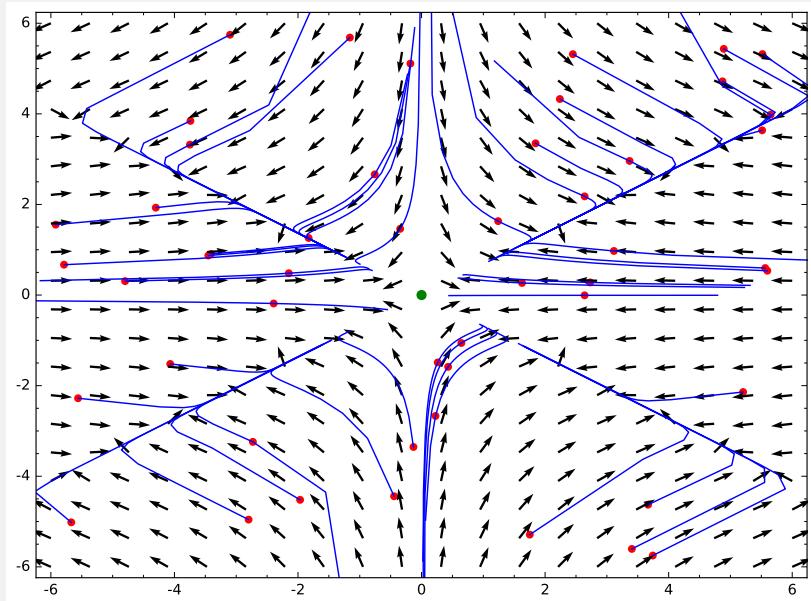
Systèmes dynamiques : 9 novembre



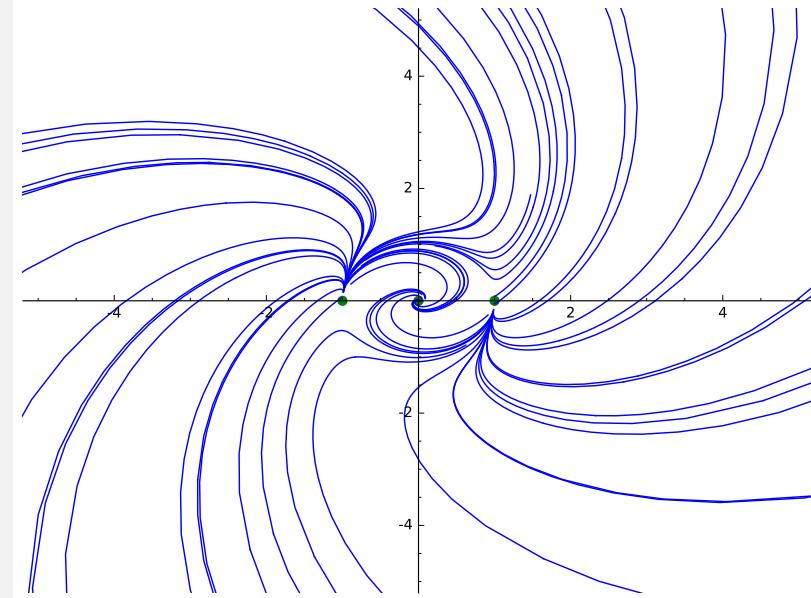
$$(x', y') = (x - y, x^2 + y^2 - 2)$$

 $\pm(1, 1)$


$$(x', y') = (2xy + x^3, x^2 - y^5)$$

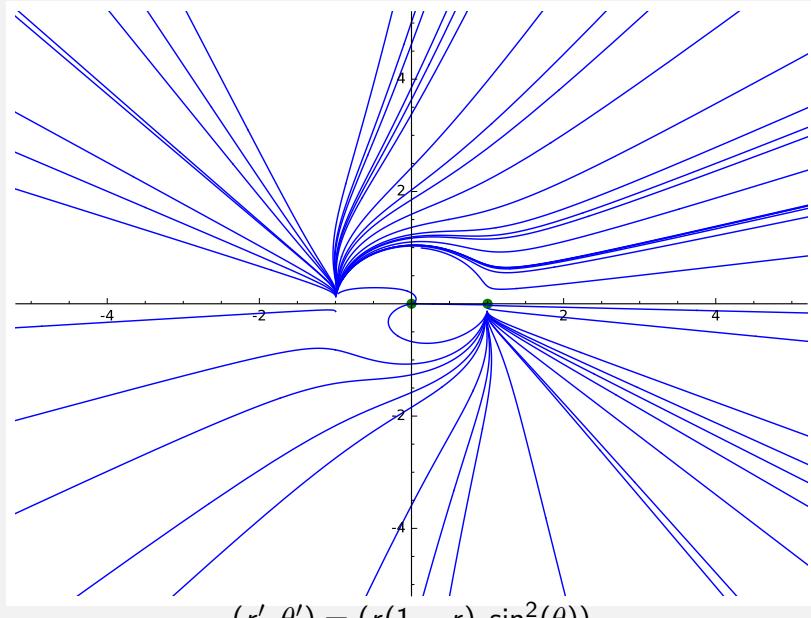
 $(0, 0)$


$$(x', y') = (xy^2 - x^3/2, -y^3/2 + x^2y/5)$$

 $(0, 0)$


$$(r', \theta') = (r(1-r), \sin^2(\theta) + (1-r))$$

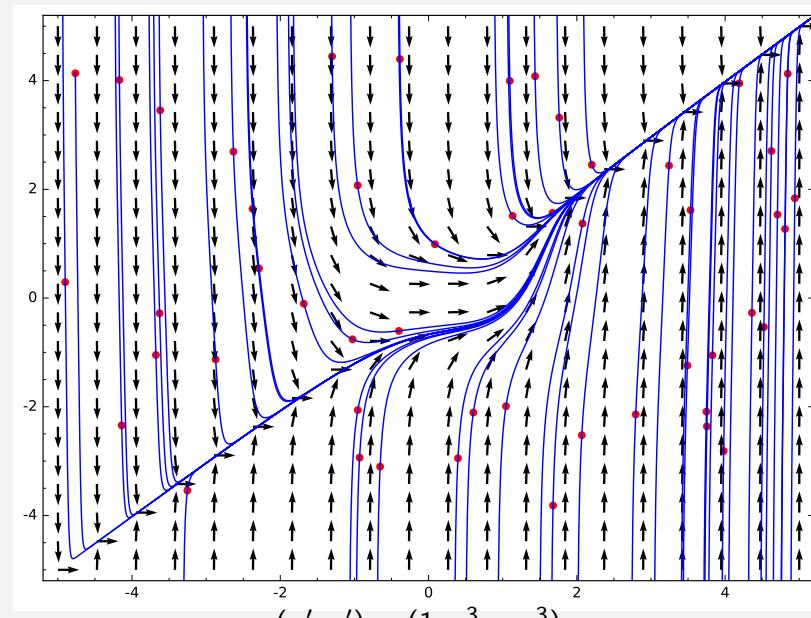
 $(0, 0), (1, 0), (-1, 0)$
 $[-1, 5] \text{cm}$



$$(r', \theta') = (r(1-r), \sin^2(\theta))$$

$$(0, 0), (1, 0), (-1, 0)$$

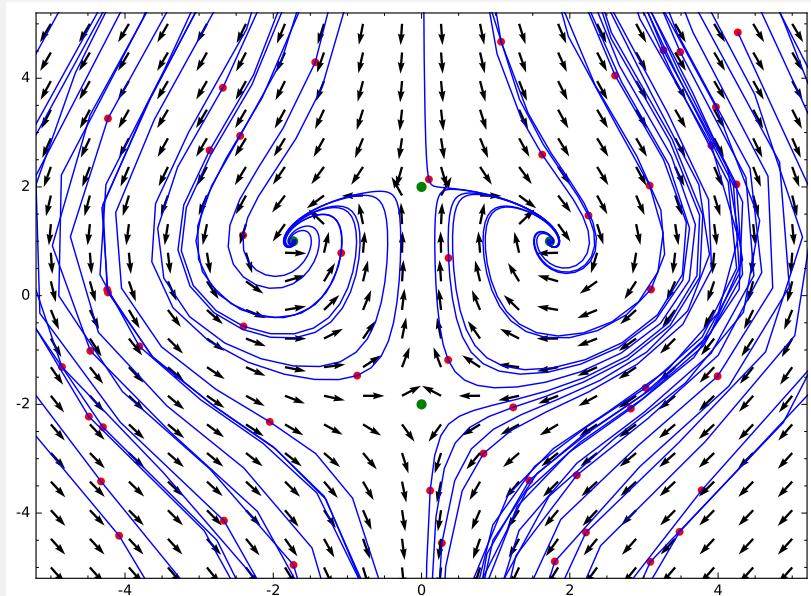
ÉD en polaire



$$(x', y') = (1, x^3 - y^3)$$

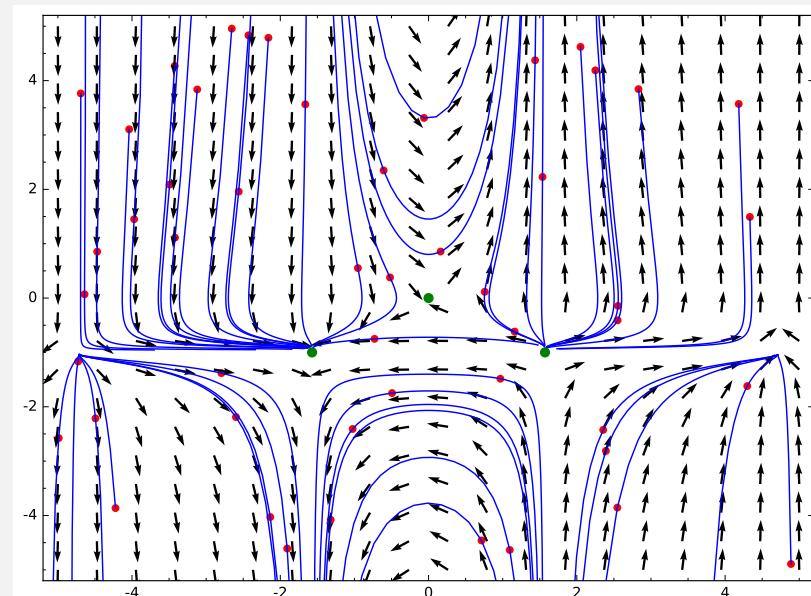
$$\{x = \}$$

$\{x = \}$



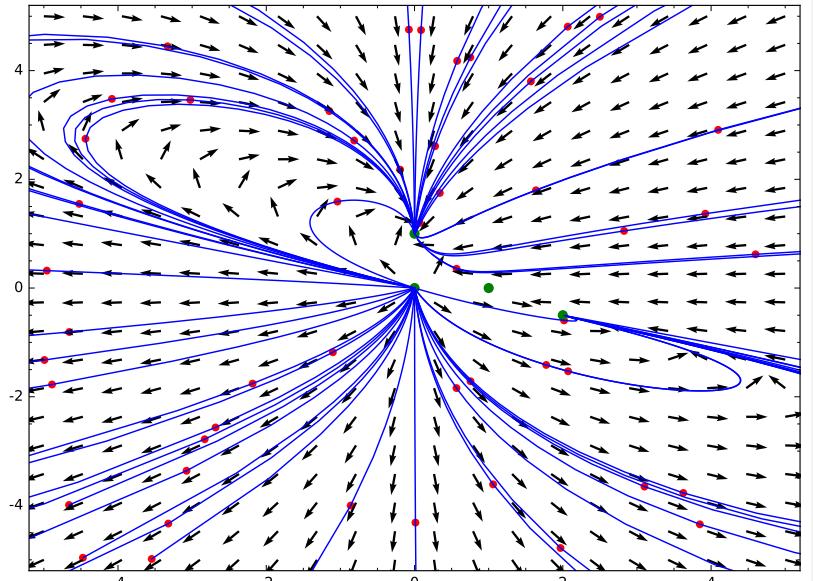
$$(x', y') = (x(y-1), 4-x^2-y^2)$$

$$(0, \pm 2), (\pm \sqrt{3}, 1)$$



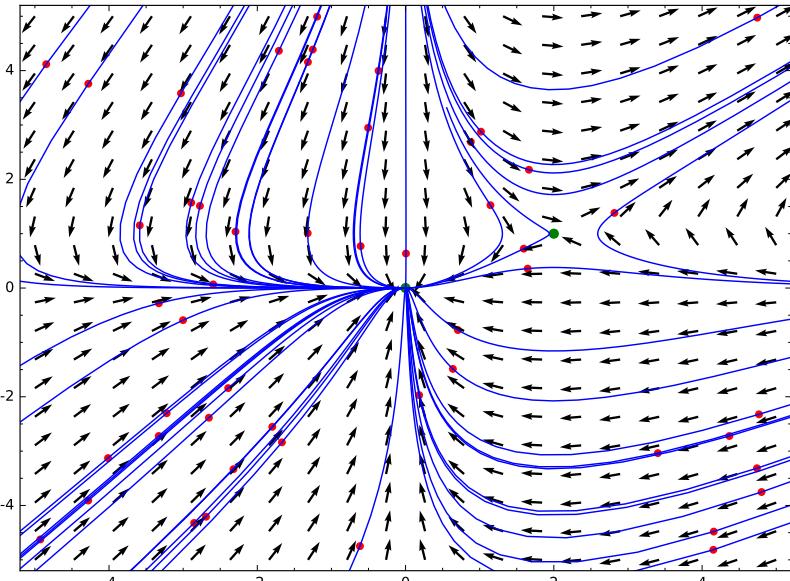
$$(x', y') = (y \cos(x), x(1+y)^2)$$

$$(0, 0), (\pi/2 + \mathbb{Z}\pi, -1)$$



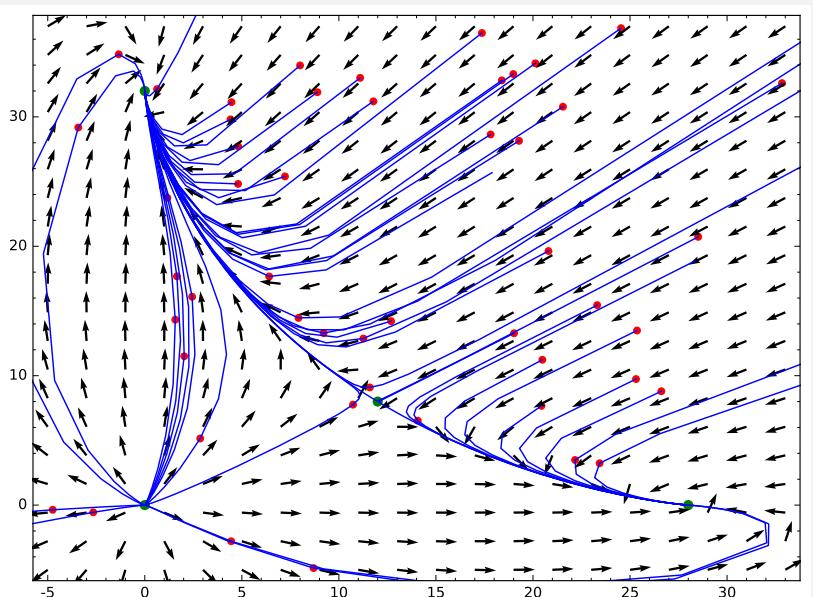
$$(x', y') = (x - x^2 - 2xy, y - y^2 - 3xy/4)$$

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



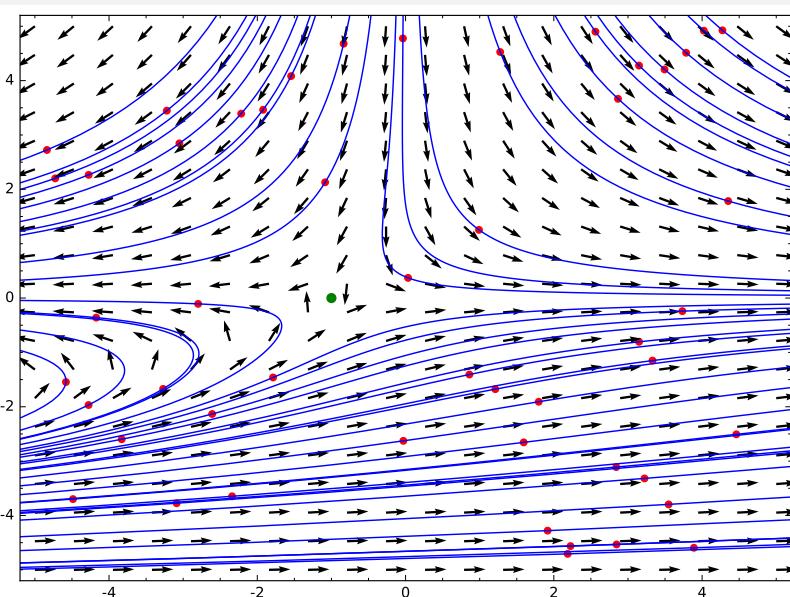
$$(x', y') = (-x + xy, -2y + xy)$$

$(0, 0), (2, 1)$



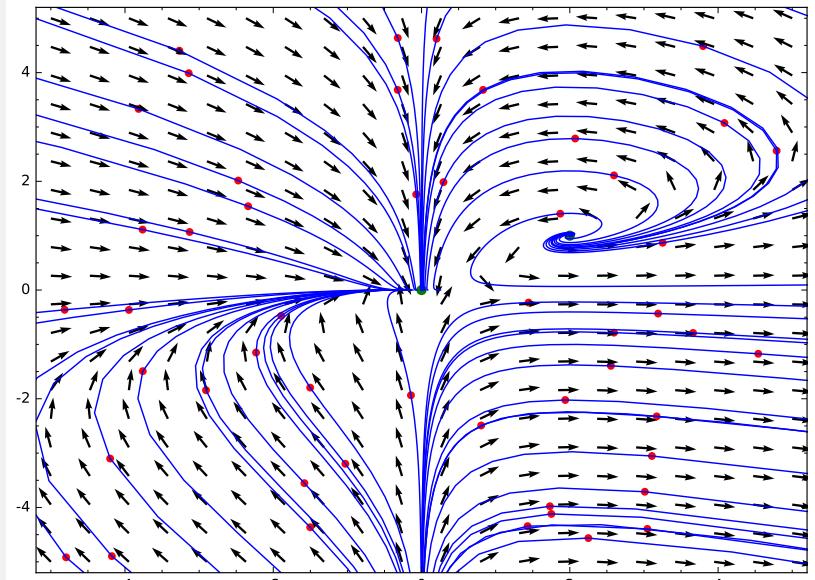
$$(x', y') = (14x - x^2/2 - xy, 16y - y^2/2 - xy)$$

$(0, 0), (28, 0), (0, 32), (12, 8)$



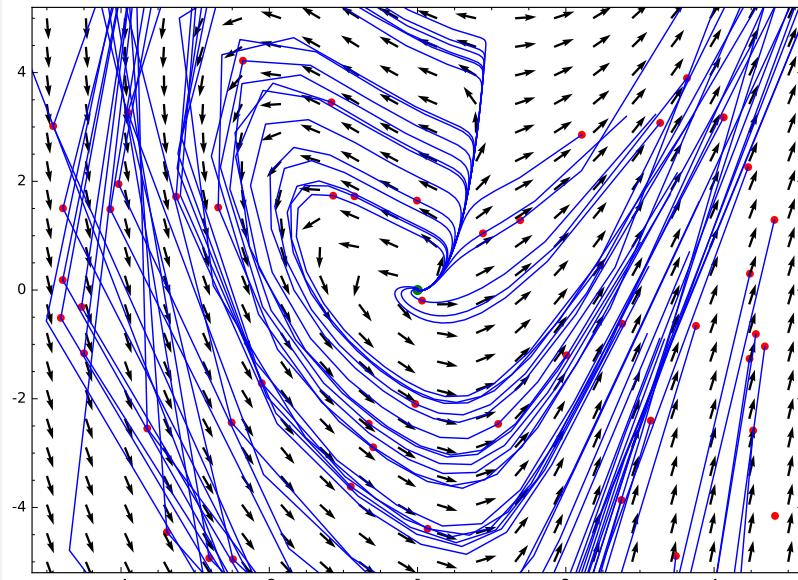
$$(x', y') = (x + e^{-y}, -y)$$

$(-1, 0)$



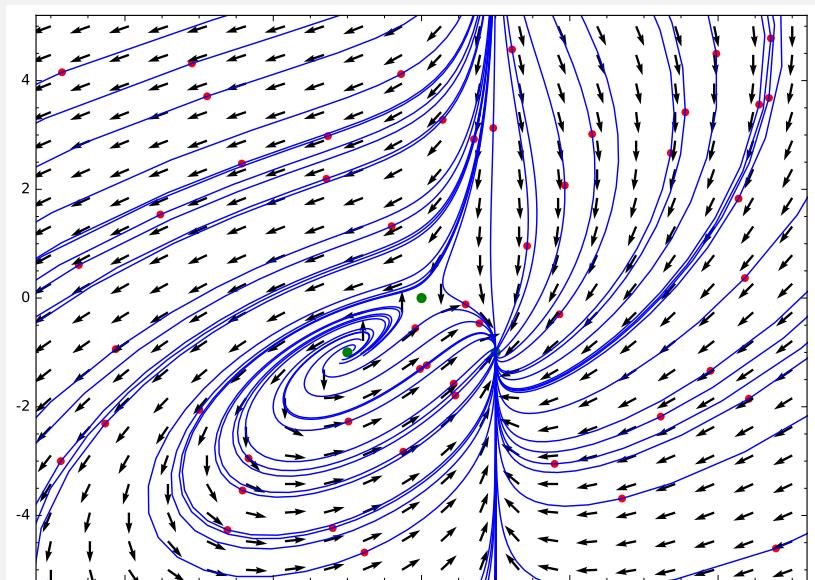
$$(x', y') = ((x - 2y)x, (x - 2)y)$$

$(0, 0), (2, 1)$



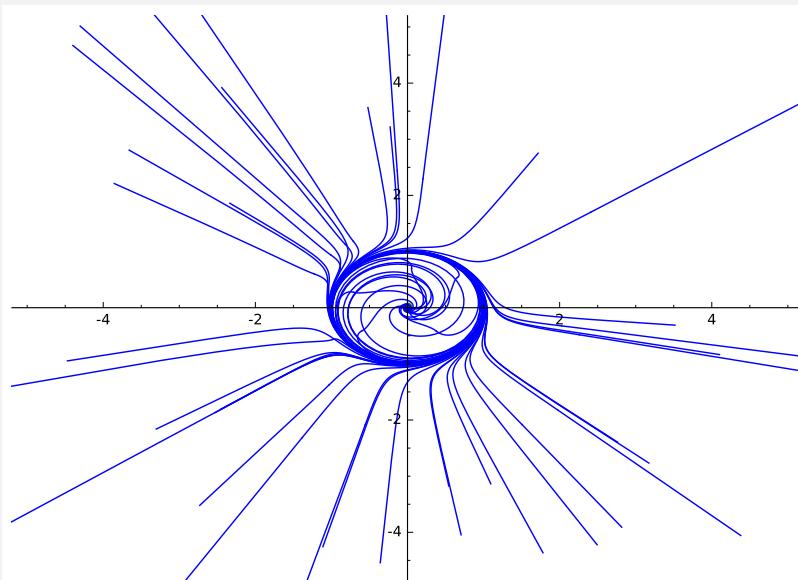
$$(x', y') = (2x - 3y + 4x^2 + 2xy, x + 2y - 3xy + 4x^3)$$

$(0, 0)$



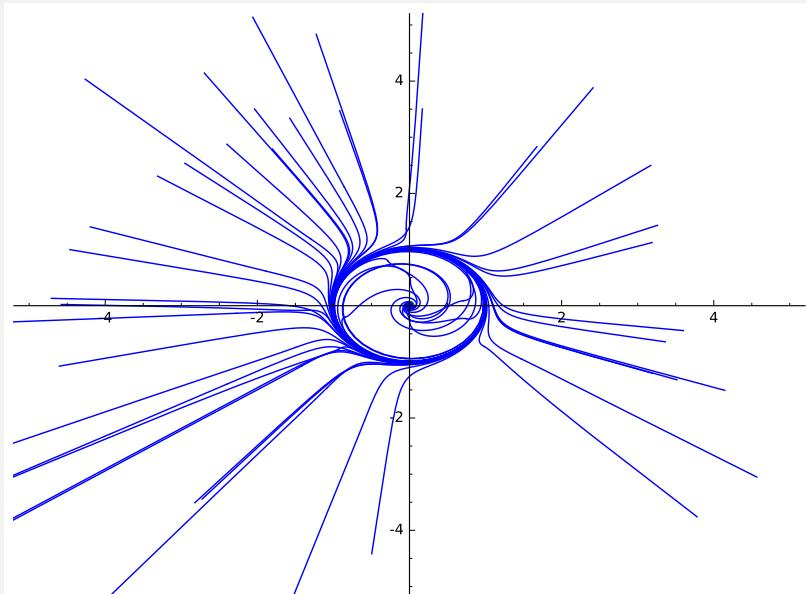
$$(x', y') = (x - y - x^2 + xy, -x^2 - y)$$

$(0, 0), (1, -1), (-1, -1)$



$$(x', y') = (-ky + x(1 - x^2 - y^2), kx + y(1 - x^2 - y^2 a))$$

$(0, 0)$



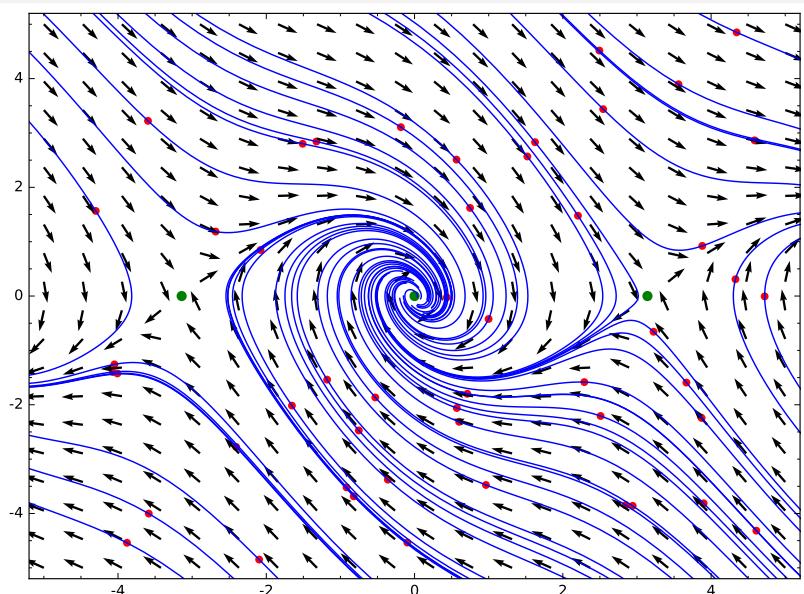
$$(x', y') = (-ky + x(1 - x^2 - y^2), kx + y(1 - x^2 - y^2))$$

$$(0, 0)$$

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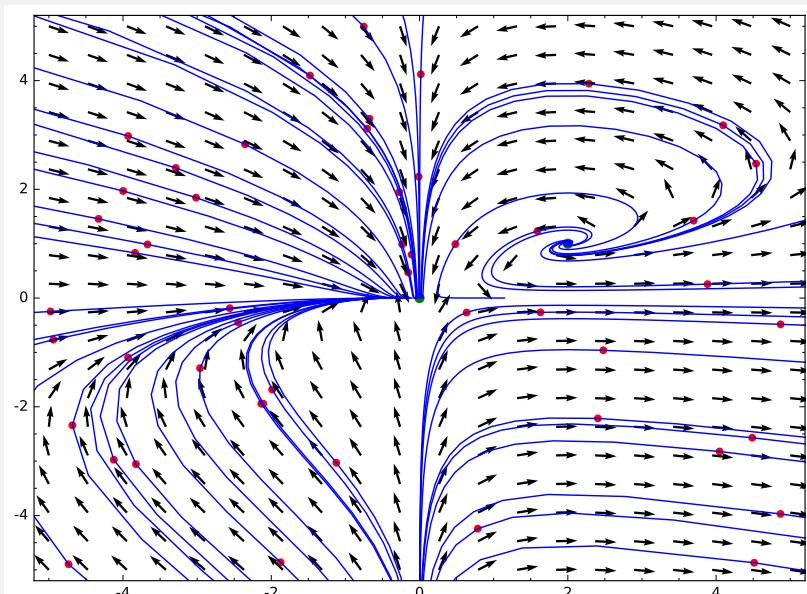
$$(x', y') = (y, -y - 2 \sin x)$$

$$\mathbb{Z}(\pi, 0)$$

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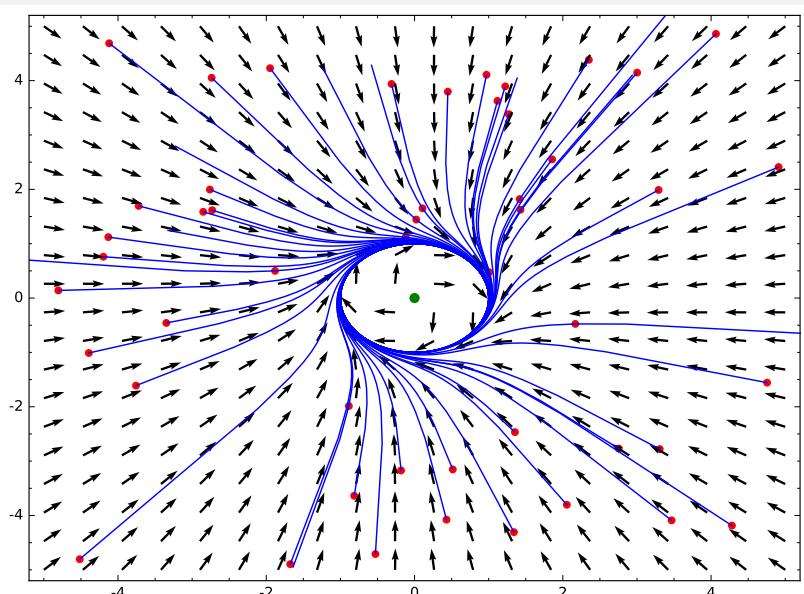
$$(x', y') = ((x - 2y)x, (x - 2)y)$$

$$(0, 0), (2, 1)$$

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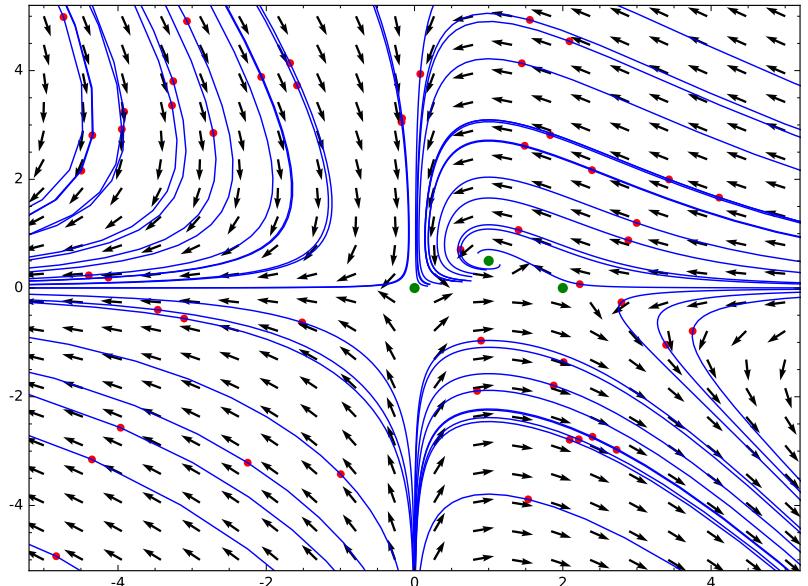
$$(x', y') = (x + y - x(x^2 + y^2), -x + y - y(x^2 + y^2))$$

$$(0, 0)$$

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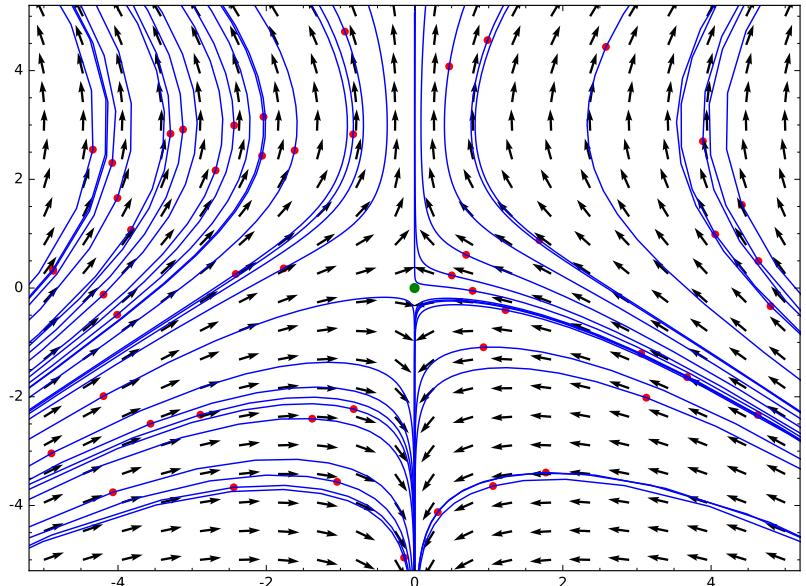
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$$(x', y') = (x(1 - x/2) - xy, xy - y)$$

$(0, 0), (2, 0), (1, 1/2)$



$$(x', y') = (-3y + yz, z + y^2)$$

$(0, 0)$