

REFACRE 5

$$5. \quad x' = ax^2 - x^3 - 4a + 4x$$

$$f(x) = ax^2 - x^3 - 4a + 4x = (x-2)(x+2)(a-x) = 0$$

$$\text{I} \quad x = 2$$

$$\text{II} \quad x = -2$$

$$\text{III} \quad x = a$$

$$f'(x) = 2ax - 3x^2 + 4$$

$$f'(2) = 4a - 12 + 4 = 4a - 8$$

$$\text{pt. } a < 2 \Rightarrow f'(2) < 0 \Rightarrow x^* = 2 \text{ local as. stabil}$$

$$\text{pt. } a > 2 \Rightarrow f'(2) > 0 \Rightarrow x^* = 2 \text{ instabil}$$

$$f'(-2) = -4a - 8$$

$$\text{pt. } a < -2 \Rightarrow f'(-2) > 0 \Rightarrow -2 \text{ instabil}$$

$$\text{pt. } a > -2 \Rightarrow f'(-2) < 0 \Rightarrow -2 \text{ local as. stabil}$$

$$f'(a) = 4 - a^2 = (2+a)(2-a)$$

a	$-\infty$	-2	2	$+\infty$
$2-a$	+	+	+	+
$2+a$	-	-	+	+
$f'(a)$	-	0	+	0

$\Rightarrow \text{pt. } a < 2 \left\{ \begin{array}{l} a \text{ este local as. stabil} \\ \text{sau } a > 2 \end{array} \right.$

$\text{pt. } a \in (-2, 2) \Rightarrow a \text{ este instabil}$