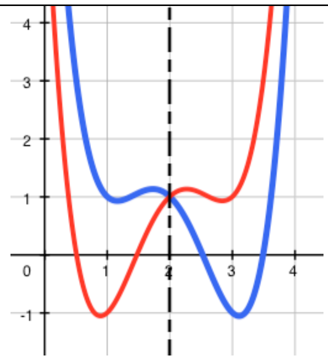
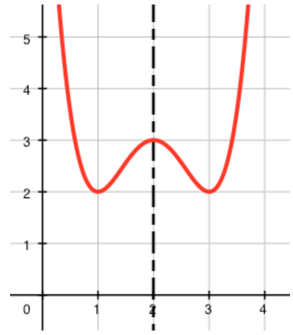
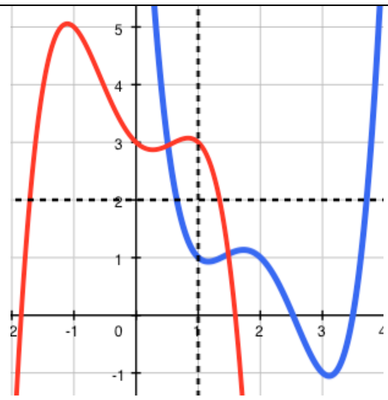
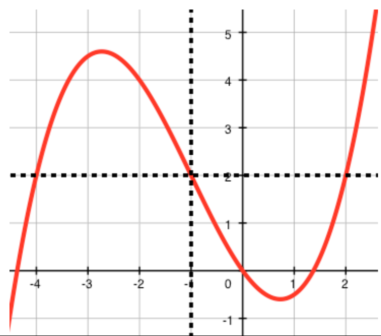
Transformations	Equations : $\underset{(x;y)}{M} \mapsto \underset{(x';y')}{M'}$	Illustrations
Axial Symmetry **Axis** **(Δ) [$x = a$]**	$\begin{cases}\frac{x+x'}{2}=a\\ y'=y\end{cases} \Leftrightarrow \begin{cases}x=2a-x'\\ y'=y=f(x)\end{cases} \Leftrightarrow \begin{cases}y'=f(2a-x')\\ g(x')=f(2a-x')\end{cases}$ $y = g(x)$ *is the Equation* of (C′) Symm. of (C) / (Δ) *e.g.* : $\begin{cases}f(x)=x^4-8x^3+22x^2-25x+11\\ Axe : x=2\end{cases}$ $\Rightarrow \begin{matrix}y'=g(x')=f(4-x')\\ g(x)=x^4-8x^3+22x^2-23x+7\end{matrix}$ • If (C') = (C) then *for any x , f(x) = f(2a-x)* *or with X =a-x :* ***f(a – X) = f(a +X)*** ***(Δ) is an axis of symmetry for (C_f)*** •• *Let F(X) = f(a+X) then F(-X) = F(X)* *i.e. F is an* ***EVEN*** *function.* *The graph of F is symmetrical through the new axis X=0 ⇔ x =a (Δ).* $f(x)=x^4-8x^3+22x^2-24x+11$; axis : x = 2 $\because F(X)=f(2+X) = X^4-2X^2+3$; *F is EVEN*	 
Central Symmetry **Center** **I (*a;b*)**	$\begin{cases}\frac{x+x'}{2}=a\\ \frac{y+y'}{2}=b\end{cases} \Leftrightarrow \begin{cases}x=2a-x'\\ y'=2b-y)\end{cases} \Leftrightarrow \begin{cases}y'=2b-f(2a-x')\\ g(x')=2b-f(2a-x')\end{cases}$ y = g(x) *Equation* of (C′) Symm. of (C) / $I(a;b)$ *e.g.* : $\begin{cases}f(x)=x^4-4x^3+4x^2-x\\ Symm./\,centre\ \ I(1;2)\end{cases} \Rightarrow \begin{matrix}y'=g(x')=4-f(2-x')\\ g(x)=-x^4+2x^2-x+3\end{matrix}$ • If (C') = (C) then *for any x , f(x) =2b - f(2a-x)* *or with* ***X = x - a*** *:* ***f(a + X) + f(a - X) = 2b***. ***I(a;b) is a center of symmetry for (C_f)*** *Let* ***Y = y – b*** *and* ***F(X) = f(a +X) – b*** •• *Then Y =F(X) and F(-X) = - F(X)* *i.e. F is an* ***ODD*** *function.* *The graph of F is symmetrical through the new Center I : X=0; Y=0 ⇔ x =a ; y =b.* $f(x)=\frac{1}{4}x^3+x^2-\frac{1}{4}x+1$; Center : I(-1; 2) $\because F(X)=f(-1+X)-2=\frac{1}{4}X^3-\frac{9}{4}X$; *F is ODD*	 
Translation / Vector **V (*a;b*)**	$\begin{cases}x'=x+a\\ y'=y+b\\ y=f(x)\end{cases} \Leftrightarrow y'=f(x'-a)+b=g(x')$ *Equation* of (C′) *Translated* of (C) by $\vec{V}(a;b)$ $y=f(x)=x^4-2x^2+1$; *Translation by Vector* : $\vec{V}(3;2)$ $\therefore\ y= g(x)=f(x-3)+2= x^4-12x^3+52x^2-96x+66$