**COURBES ASSOCIEES**

1. **Etude de f(x) =u(x) + k**

On considère par exemple : u(x) = .

Par exemple, en A1 mettre f(x)=u(x)+k ; en B1 mettre k= et de C1 à K4 mettre les nombres entiers de -4 à 4. En B3 mettre x, en C3 mettre u(x)-4,en D3 mettre u(x)-3,….en K3 mettre u(x)+4.

De B4 à B16 mettre les nombres de-3 à +3 par pas de 0,5.

***Ecrire une formule qui permet de compléter ce tableau de valeurs, pour*** –***3 ≤x ≤ 3 , de u(x)-4, u(x)-3,….u(x)+4 puis tracer leurs courbes. Quelle propriété constate-t-on ? .***

Voilà ce qu’on obtient:

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| |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | f(x)=  u(x)+k | k= | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | |  |  |  |  |  |  |  |  |  |  |  | |  | x | u(x)-4 | u(x)-3 | u(x)-2 | u(x)-1 | u(x) | u(x)+1 | u(x)+2 | u(x)+3 | u(x)+4 | |  | -3 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | |  | -2,5 | 2,25 | 3,25 | 4,25 | 5,25 | 6,25 | 7,25 | 8,25 | 9,25 | 10,25 | |  | -2 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |  | -1,5 | -1,75 | -0,75 | 0,25 | 1,25 | 2,25 | 3,25 | 4,25 | 5,25 | 6,25 | |  | -1 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | |  | -0,5 | -3,75 | -2,75 | -1,75 | -0,75 | 0,25 | 1,25 | 2,25 | 3,25 | 4,25 | |  | 0 | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | |  | 0,5 | -3,75 | -2,75 | -1,75 | -0,75 | 0,25 | 1,25 | 2,25 | 3,25 | 4,25 | |  | 1 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | 5 | |  | 1,5 | -1,75 | -0,75 | 0,25 | 1,25 | 2,25 | 3,25 | 4,25 | 5,25 | 6,25 | |  | 2 | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |  | 2,5 | 2,25 | 3,25 | 4,25 | 5,25 | 6,25 | 7,25 | 8,25 | 9,25 | 10,25 | |  | 3 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | |

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**Solution :**

Entrer en C4 la formule = $B4^2+C$1. Tirer vers la droite et vers le bas de C4 à K16.

Sélectionner la plage de B3 à C16 et à l’aide de l’assistant graphique choisir « nuage de points avec courbes lissées »….

1. **REINVESTISSEMENT**

***De la même façon illustrer les cas : 1° f(x)= u(x + k) ; 2° f(x)=k u(x) ; 3°f(x) = k u ( ).***

***Puis recommencer avec u(x) = puis u(x) =….***

**Solution : *Pour f(x)=u(x-k)*** mettre en C4 : =($B4-C$1)^2 et tirer vers la gauche et vers le bas…

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | f(x)=u(x-k) | k= | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 | |  |  |  |  |  |  |  |  |  |  |  | |  | x | u(x-4) | u(x-3) | u(x-2) | u(x-1) | u(x) | u(x+1) | u(x+2) | u(x+3) | u(x+4) | |  | -3 | 1 | 0 | 1 | 4 | 9 | 16 | 25 | 36 | 49 | |  | -2,5 | 2,25 | 0,25 | 0,25 | 2,25 | 6,25 | 12,25 | 20,25 | 30,25 | 42,25 | |  | -2 | 4 | 1 | 0 | 1 | 4 | 9 | 16 | 25 | 36 | |  | -1,5 | 6,25 | 2,25 | 0,25 | 0,25 | 2,25 | 6,25 | 12,25 | 20,25 | 30,25 | |  | -1 | 9 | 4 | 1 | 0 | 1 | 4 | 9 | 16 | 25 | |  | -0,5 | 12,25 | 6,25 | 2,25 | 0,25 | 0,25 | 2,25 | 6,25 | 12,25 | 20,25 | |  | 0 | 16 | 9 | 4 | 1 | 0 | 1 | 4 | 9 | 16 | |  | 0,5 | 20,25 | 12,25 | 6,25 | 2,25 | 0,25 | 0,25 | 2,25 | 6,25 | 12,25 | |  | 1 | 25 | 16 | 9 | 4 | 1 | 0 | 1 | 4 | 9 | |  | 1,5 | 30,25 | 20,25 | 12,25 | 6,25 | 2,25 | 0,25 | 0,25 | 2,25 | 6,25 | |  | 2 | 36 | 25 | 16 | 9 | 4 | 1 | 0 | 1 | 4 | |  | 2,5 | 42,25 | 30,25 | 20,25 | 12,25 | 6,25 | 2,25 | 0,25 | 0,25 | 2,25 | |  | 3 | 49 | 36 | 25 | 16 | 9 | 4 | 1 | 0 | 1 | |  |  |  |  |  |  |  |  |  |  |  | |

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***Pour f(x) = k u(x),*** remplacer cette formule par =C$1×($B4^2)… continuer…..

1. **Etude de f(x) = u(x-a) +b.**

On pose encore : u(x)= . On pourra si on le désire changer ensuite de fonction de référence u.

En A1 mettre f(x)=u(x-a)+b. En C1 « a= »et rentrer la valeur en D1. En E1 « b= » et rentrer la valeur en F1. En B3, x= ; en C3, u(x) et en D3, u(x-a)+b. De B4 à B16 mettre de nouveau les valeurs de -3 à 3 par pas de 0,5.

Fixer par exemple a=1 et b=2.

***Ecrire la formule permettant de remplir le tableau de valeurs et tracer les courbes de u et f.***

***Recommencer avec d’autres valeurs de a et b. Que constate-t-on ?***

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | f(x)=u(x-a)+b | | a= | 1 | b= | 2 |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |  | x= | u(x) | u(x-a)+b |  | | | | |  | |  | -3 | 9 | 18 |  | |  | -2,5 | 6,25 | 14,25 |  | |  | -2 | 4 | 11 |  | |  | -1,5 | 2,25 | 8,25 |  | |  | -1 | 1 | 6 |  | |  | -0,5 | 0,25 | 4,25 |  | |  | 0 | 0 | 3 |  | |  | 0,5 | 0,25 | 2,25 |  | |  | 1 | 1 | 2 |  | |  | 1,5 | 2,25 | 2,25 |  | |  | 2 | 4 | 3 |  | |  | 2,5 | 6,25 | 4,25 |  | |  | 3 | 9 | 6 |  | |  |  |  |  |  | |  |  |  |  |  |  |  |  |  |  | |

**Solution :**

En C4 mettre = B4^2. En D4 mettre =(B4-$D$1)^2+$F$1 (bloquer les cases où figurent a et b).

On vérifie que :

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| **La courbe de f(x)= u(x-a)+b se déduit de celle de u dans la translation de vecteur (a, b)** |

**Remarque :**

Pour f(x) = k u ( ) la courbe de f se déduisait de celle de u dans l’homothétie de centre O et de rapport k. Le démontrer….