



## Language-Enhanced User-Adaptive Interactive e-learning for Mathematic

présenté par JM Labat et P Jarraud (UPMC)

- ▶ **Un projet de recherche au début allemand (DFKI)**
- ▶ **puis européen pour la diffusion (multilingue)**
- ▶ **pour l'enseignement des mathématiques**
- ▶ **associant**
  - ▷ **informaticiens**
  - ▷ **mathématiciens**

### Partenaires

- ▶ **Université de Sarrebruck (DFKI)**
- ▶ **Université Louis Maximilien, Munich**
- ▶ **Université Eötvös Loránd, Budapest**
- ▶ **Université Charles, Prague**
- ▶ **Université Pierre et Marie Curie, Paris**
- ▶ **Collège St. Michael, Zaadam, (Pays Bas)**
- ▶ **TeMaCom (SSI)**

site

<http://www.leactivemath.org>

Une volonté pédagogique, de type constructiviste

## Concepts sous-jacents

- ▶ **l'apprentissage se fait**
  - ▷ par l'activité
  - ▷ par autoguidage
  - ▷ de manière constructive
  - ▷ en tenant compte du contexte
- ▶ les **apprenants** jouent un rôle actif dans leur processus d'apprentissage
- ▶ les **enseignants** peuvent se concentrer sur leur préparation et ont essentiellement à offrir de l'assistance pendant la classe.

## Réalisation in LeActiveMath

- ▶ exercices, applets, outils
- ▶ structure non linéaire et génération de cours
- ▶ facile à essayer
- ▶ options pour la pratique en classe et à la maison
- ▶ possibilité de garder des annotations
  - ▷ une pédagogie constructiviste mais pragmatique qui n'abandonne pas complètement l'instruction classique
  - ▷ compatible avec les environnements Web

# Un concept clef



## Faire ses propres "livres" avec des « granules »



Hello Mr. x.

This is the main page of ActiveMath. Please choose one of the books.

### Prerecorded Books

English Books:

- Complete Content of LeAM\_calculus  
Number of pages: 220
- Highschool Content of LeAM\_calculus  
Number of pages: 166
- LeActiveMath Grade 11  
Number of pages: 40
- Secondary School Content of LeAM\_calculus  
Number of pages: 160
- University Content of LeAM\_calculus  
Number of pages: 192
- Zoology of exercises in LeAM\_calculus  
Number of pages: 34

### Personal Books

- BKL-Buch  
Number of pages: 14
- ICMaBuch  
Number of pages: 6
- Mein Buch  
Number of pages: 6
- argumentieren  
Number of pages: 2
- book x  
Number of pages: 29

[Create a book](#)

This is an evaluation server of the [LeActiveMath](#) research project.

To use LeActiveMath, you need:

- [Firefox, at least version 1.5](#), or Internet Explorer 6 (other browsers may work, but are not our primary target). Cookies and Javascript need to be enabled.
- [Java Plugin](#) for your browser
- screen size: 1024x768 or better.
- a fast Internet connection (DSL).

Server updates will be installed daily between 12:30 and 1:30 pm GMT. You might be experiencing server downtimes during this period. We are sorry for the inconvenience.

Lors de la première utilisation, il n'y a pas de livre personnel

Page d'accueil de Mr. x

Une utilisation loguée permet d'avoir un profil (langue, niveau sujets, ...)

Spécifications techniques

# Exemples



Une volonté d'exemples "concrets", attirants (ici pour introduire la notion de dérivée via la pente)

The screenshot shows the LeActiveMath website interface. On the left is a navigation menu with a sidebar for 'LeActiveMath Grade 11' containing sections 1 through 8. Section 1 'Introduction' is expanded, and 'A hiking tour' is selected. The main content area shows the lesson title 'A hiking tour' and a description: 'Mary and Michael were on a hiking tour. Their hiking booklet contains a profile of their tour.' Below the text is a graph showing a hiking profile. The vertical axis is labeled '[m]' and ranges from 0 to 800. The horizontal axis is labeled '[km]' and ranges from 0 to 4. The graph shows a curve starting at (0,0), rising to a peak at approximately (2.5, 800), and then descending to (4,0). Icons of a mountain hut, a restaurant, and a bus stop are placed along the curve. A blue arrow points from the 'A hiking tour' item in the sidebar to the lesson title in the main content area.

LeActiveMath Grade 11 > Introduction > A hiking tour

### A hiking tour

Mary and Michael were on a hiking tour. Their hiking booklet contains a profile of their tour.

From their starting point (the famous arena) they have first reached some mountain hut, then walked a steep fixed rope route to reach the mountain top. From there they descended to a restaurant and then to their final destination, the bus stop in the next village. Now they care for the slope they have overcome.

Dans le bandeau de gauche chaque carré représente une page et le code couleur indique la maîtrise du sujet par l'étudiant

## Animation/illustration

**LeActiveMath**  
Grade 11

- 1 Introduction
- 2 What about the average?
- 3 Difference quotients
- 4 Actual slope
- 5 Derivative functions
  - Differential quotient
  - Try it for yourself (dynamic elements)
  - Derivative function**
  - Try it for yourself (dynamic elements)
  - The end of the hiking tour
- 6 Supplement: Changes and
- 7 Computing the derivatives
- 8 Differentiation rules

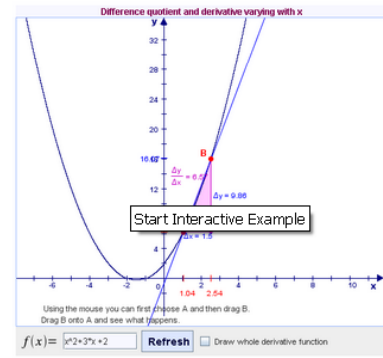
Derivative function 13/40

Mary and Michael have obtained the value 1 for the slope in the fixed rope route: on every meter in horizontal direction, the route also ascended one meter in vertical direction. If they had a traffic sign at that place, it would thus warn for a 100% slope. Now Mary and Michael are impressed. But was this really the steepest point? In order to decide this, Mary and Michael would need to know the slope at every point of their tour. For that they need a new function that assigns to every  $x$  the value of the slope of their profile at  $x$ .

**Derivatives everywhere** ★★★

Exemples et exercices sont annotés par une valeur estimée de la difficulté

In the following applet you should once more repeat the steps to determine the derivative. Everytime you carry this out for some value  $x$ , you will be shown not only the tangent, but also the value of its slope will be marked with a cross. Thus the cross marks the value of the derivative  $y'(x)$ . When carrying this out for different values of  $x$  you can observe how  $y'(x)$  varies with  $x$ . Using the additional button you should finally take a look at the whole "derivative function". Its graph connects all the crosses.



[Your Opinion](#)

**Definition of the derivative function**

Suppose a function  $f$  is defined on an interval  $I$ . Then this function is called **differentiable (in  $I$ )** if it is differentiable at every  $x_0 \in I$ , i.e., if the limit  $\lim_{x \rightarrow x_0} \frac{f(x) - f(x_0)}{x - x_0}$  exists for all  $x_0 \in I$ . The function  $f'$  (say: "f-prime") that assigns the value  $f'(x)$  to every  $x \in I$ , is called **derivative function (of  $f$  in  $I$ )**.

Cet exemple utilise une applet interactive qui est démarrée en cliquant sur le schéma

## Illustration d'un théorème

Page d'accueil | Rechercher | Notes | Mon profil | Outils | Imprimer | Se déconnecter

**ActiveMath**

Théorème des accroissements finis

170/220

$f'(\xi) = \frac{f(b) - f(a)}{b - a}$

Ainsi la tangente au point  $(\xi | f(\xi))$  est parallèle à la sécante passant par les points  $(a | f(a))$  et  $(b | f(b))$ .

JE



## Beaucoup d'outils

- ▶ Outils interactifs
  - ▷ Applets Java
  - ▷ Editeur pour les entrées de nombres et de formules
  - ▷ Calcul symbolique
- ▶ Outils d'autoformation
  - ▷ Recherche simple et avancée
  - ▷ Création de cours
  - ▷ Edition de livres
  - ▷ Outil de « **Concept mapping** » (iCMap)

## Des questions/problèmes

- ▶ notations différentes selon les pays
- ▶ façons d'aborder les notions différentes (par exemple sur les limites)
- ▶ sujets (ex : développements limités/ L'Hôpital)
  - ▷ comment échanger ?
  - ▷ mieux se connaître
  - ▷ sans déstabiliser

[pierre.jarraud@upmc.fr](mailto:pierre.jarraud@upmc.fr)  
[jean-marc.labat@upmc.fr](mailto:jean-marc.labat@upmc.fr)