

GeoGebra Functions 1

Using GeoGebra - Input Function,
Point on a function, Domain of a function,
Derivative of a function

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Key Concepts from GeoGebra

1. Input a function.
2. Use GeoGebra Function "Point" to input a point on a function.
3. Use GeoGebra Function "Function" to fix domain of function.

Key Concepts from Mathematics

1. Uses fact that tangent line to $f(x)$ at $x=a$ is: $T(x)=f'(a)(x-a)+f(a)$ to illustrate power of GeoGebra functions.

Our goal

Learn how to input functions, points on functions and restrict the domain. Use a slider and the derivative function (built-in) to dynamically draw the tangent line.

Hints & Tips

1. Remember GeoGebra is case sensitive
 - a. Capital letters
 - i. Points (A, B, C, ..., A_1)
 - b. Small letters
 - i. segments, lines (a, b, c, ..., a1, a_1)
 - ii. vectors (u, v, w, ...)
 - iii. functions (f(x), g(x), ... , F(y), a(z),..., f_p(x),...)

Script-o-matic


1. Open GeoGebra and Set-up

- Turn on the Algebra Window: View -> *Algebra Window* (or Ctrl+A)
- Turn on the Input field: View -> *Input field*
- Turn on the axes: View -> *Axes*


2. Input a quadratic function

- Click in the input field.
- Type: $f(x) = x^2 - 3x + 2$ and press Enter.
The function $f(x)$ is a free object and graphed on the standard axes.


3. Move the drawing pad

- Click on the Move Drawing Pad icon: 
- Click in the drawing area in the middle of the function and pull the axis down and left.
My choice: Lower left corner (-3.2, -2.2)
see: Lesson 6 for how to change the axes to specific values.

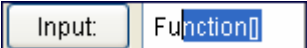
4. Draw a point on the function.



- Click on the point icon: 
- Move cursor over function until it darkens and then click.
- Notice that the created point A is a free object.
Right-click on A in the algebra window and then click on Redefine. Notice that the definition of A is: $A = \text{Point}[f]$. Click on Cancel.

5. "Input" a point

- Click in the input field.
- Type: B=Po
- It will self complete: 
- Using the arrow keys move the cursor between the brackets.
- Type f and press Enter
The point B will be drawn - by default it is the y-intercept of f.

6. Fix the domain of f

- Click in the input field.
- Type: Fu (it is case sensitive so don't type "fu")
- It will self complete: 
There are three parts to this: function name, left limit a, right limit b.
- Using the arrow keys move the cursor between the brackets.
- Type (no quotes) "f,-1,5" and press Enter.

- f. Notes: this dependent object is also a function g – you must have define both g and g to get a function with a limited domain and $a < b$ otherwise this object (function g) will be "undefined".
 - g. Hide f . (Right-click on f and deselect 'Show object').
 - h. Change properties of g
My choice: thick(4) and red(255,0,0) and rename to f_r .
7. Define the derivative functions of f .
- a. Click in the input field.
 - b. Type: $f'(x)$ and press Enter. (use single quote for derivative mark)
Notice that GeoGebra will automatically label this function $h(x)$
– that is you don't actually have to name your input.
 - c. Now, rename $h(x)$ to f_1 (Notice in the algebra window: f_1)
 - d. Click in the input field.
 - e. Type $f_2(x)=f''(x)$ and press Enter. (use two single quotes)
 - f. You can hide these two functions.
8. The Tangent Line to f at point $x=a$
We want a to go between our interval on f , which is $[-1,5]$
(see part 6 above) so we make a slider.
- a. Click on the slider icon  under Angle.
 - b. Click anywhere blank on the drawing pad
 - c. Put in the min:-1 and max:5. Change increment as desired. Click on OK.
The default value of a is 0.
 - d. Click in the input field.
 - e. Type $T_f(x)= f'(a)(x-a)+f(a)$ and press Enter
Use either a blank or a $*$ between $f'(a)$ and $(x-a)$.
The tangent line to f at $a=0$ will be drawn.
 - f. Click and drag the point on the slider left and right.
9. Intersection point
- a. Click on the intersection icon  under Point.
 - b. Click on the function and then on the tangent line.
The intersection point C will be drawn.
10. Finish up
- a. Hide the points A and B as desired.
 - b. Change the properties of the point C to show the value.
(In our next lesson – HiT1 see how to position the value of C dynamically!)
 - c. Save your file as functions1.ggb.