Math 1110: **Derivatives (Thomas 3.1-3.2)** Sept 12 (Wed)

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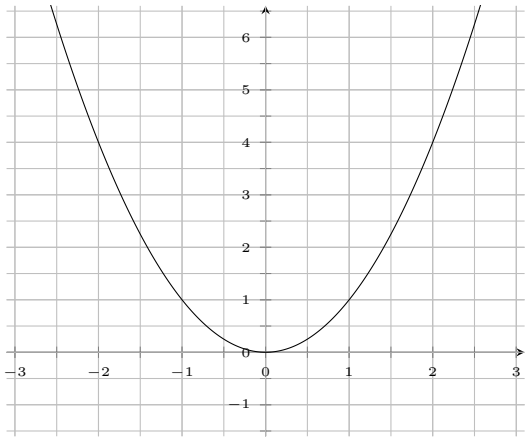
1. Objectives.

- the definition of a derivative.
- using the definition of the derivative to compute the derivative of a function.
- given a graph of the function, sketching the graph of the derivative.

2. Definition of Derivatives.

For a function $f(x)$, its derivative is written $f'(x)$ (we call it "*f prime of x*"). Write down the two equivalent formulas for $f'(x)$.

Let us consider the function $f(x)$ below. Drawing the tangent line, we want to estimate the value of the derivative $f'(x)$ at the points $x_0 = -1$, $x_0 = 0$, $x_0 = 1$, $x_0 = 2$.



1) What is your estimate for $f'(-1)$ (this notation stands for the derivative of $f(x)$ at the point $x_0 = -1$)? What about $f'(0)$, $f'(1)$ and $f'(2)$?

2) As you may have guessed, the function above is $f(x) = x^2$.
Using the definition of the derivative (that you have written above), compute the derivative $f'(1)$.
Does your answer correspond your estimate?

3) Compute the derivative $f'(2)$ using the definition.

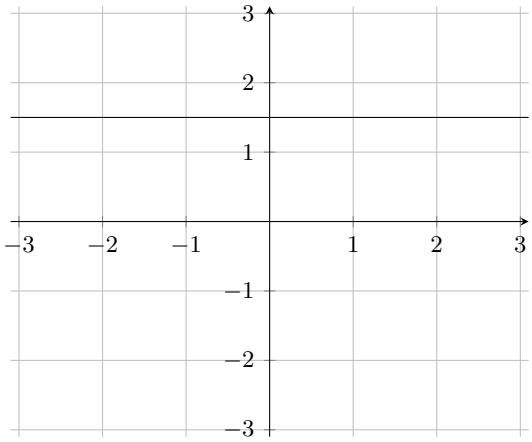
4) Still using the definition of the derivative, compute $f'(x)$ for any x.

3. Sketching the derivative.

We have seen that the derivative of a function at a point is the slope of the tangent line. Keeping this in mind, for each of the following functions, sketch the graph of the derivative of the function. Your sketch doesn't have to be extremely precise, nevertheless the following aspects should be taken into account:

- where is the derivative positive, or negative,
- where is the derivative zero,
- where is the derivative increasing, or decreasing.

1)



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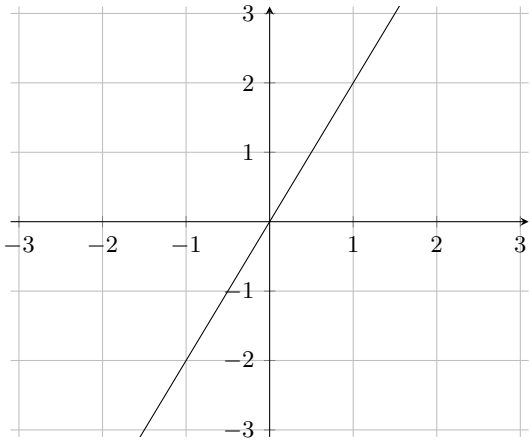

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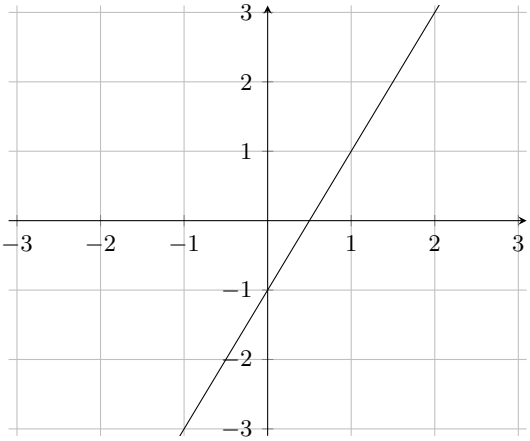

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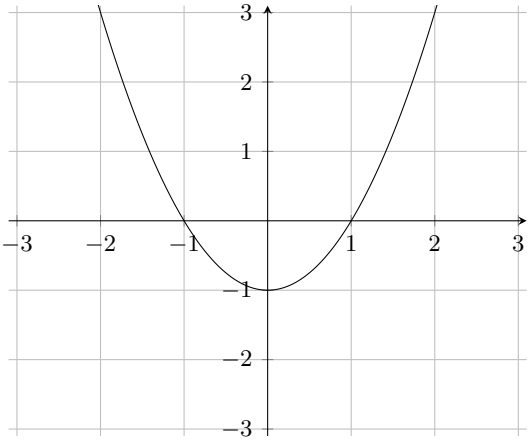

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