Math 1110: **More on Derivatives** Sept 14 (Fri)

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## 1. Objectives

Today we will learn how to:

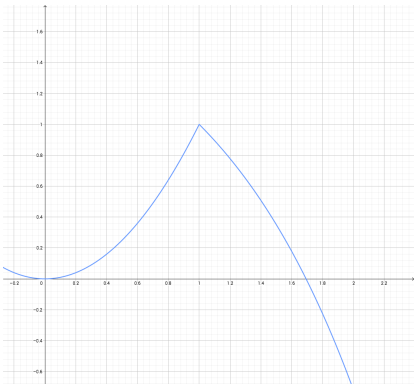
- using the definition, determine on which intervals a function is differentiable and on which it is not. This implies being able to compute one-sided derivatives and be able to determine when it does not exist
- list the cases where a function is not differentiable and draw the corresponding graphs,
- recognize on a graph where a function fails to be differentiable.

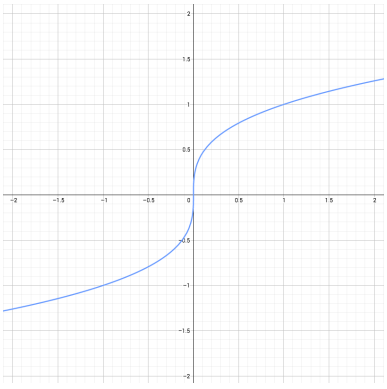
## 2. Examples

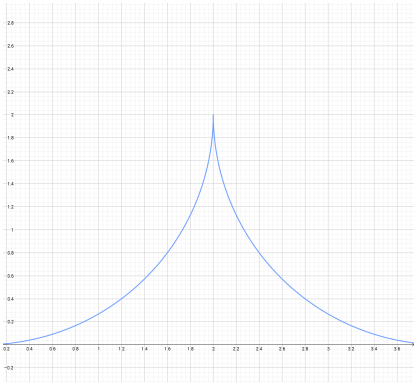
We have seen that the definition of the derivative at a point $x$ is given by

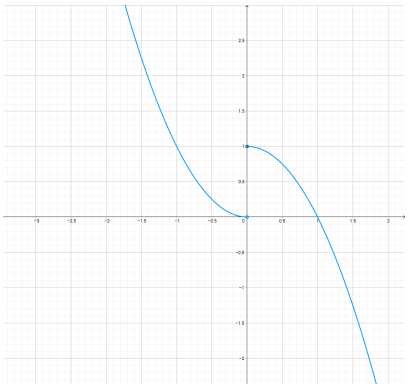
$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h} = \lim_{z \to x} \frac{f(z) - f(x)}{z - x}.$$

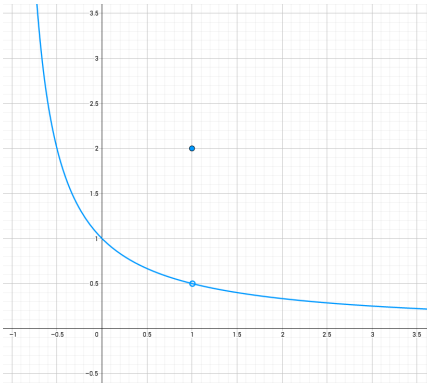
Keeping the definition in mind, consider the following graphs. For each of them, indicate the point(s) for which the function fails to be differentiable and give a short explanation of why it fails to be differentiable, using the definition.

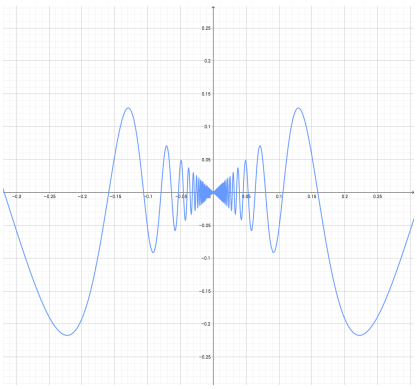
1. 

2. 

3. 

4. 

5. 

6. 

### 3. Summary

Looking at the graphs, list some things that can go wrong that prevent a function from being differentiable. To which graphs from part 2 do these things correspond?