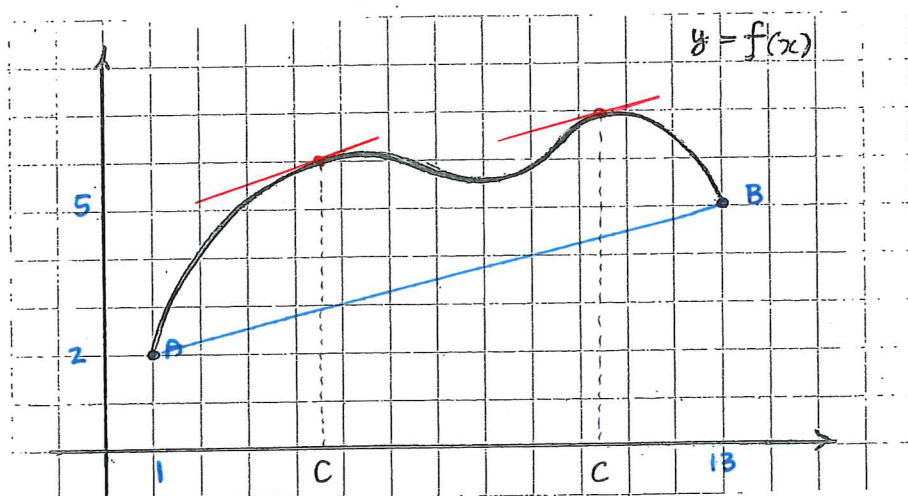# WORKSHEET 4: Intro to Mean Value Theorem
Jan 24, 2018

Consider the following graph. Answer the following questions.

1. What are the coordinates of the two endpoints on the domain of f?

   $A = (1, 2)$ $\qquad\qquad$ $B = (13, 5)$

2. Is this function continuous on the closed interval $[1, 13]$?

   Yes, there's NO hole or jump in this interval.

3. Is this function differentiable on the open interval $(1, 13)$?

   Yes, there's NO corner or cusp in this interval.

4. What do we call the line passing through these points? Secant line.

5. Find the slope of the secant line between the two endpoints, namely the **average slope**.

   $$m_{sec} = \frac{f(13) - f(1)}{13 - 1} = \frac{5 - 2}{13 - 1} = \frac{3}{12} = \frac{1}{4}$$

6. Draw a line tangent to the curve of f and parallel to the secant line. There might be more.

7. Identify the point of tangency and call its x-coordinate c. How can you represent the slope of the tangent line in terms of the derivative of the function?

   Slope of the tangent line at $x = c$ is equal to the derivative at that point
   $\hookrightarrow f'(c)$

8. Now that you have a tangent line at c which is parallel to the secant line, write down a mathematical formula that describes the relationship between their slopes.

   Two parallel lines have equal slopes, so

   m_{sec} through A and B $= m_{tan}$ at c

   $$\frac{f(13) - f(1)}{13 - 1} = \frac{1}{4} = f'(c)$$