MATH 121

RATES OF CHANGE

GOALS

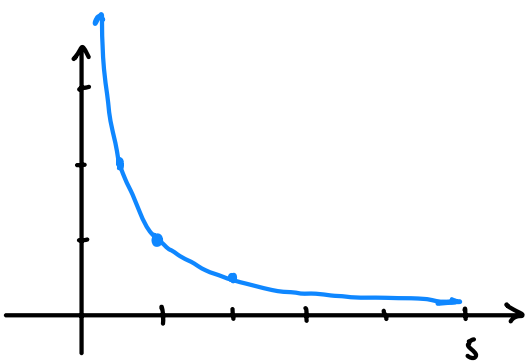
- ☐ DEFINE AVERAGE RATE OF CHANGE
- ☐ GIVEN A FUNCTION AND TWO x-VALUES, FIND EQUATION OF SECANT LINE
- ☐ USE LIMITS TO DEFINE AND COMPUTE INSTANTANEOUS RATE OF CHANGE
- ☐ GIVE A FUNCTION f AND $x=a$, FIND EQUATION OF TANGENT LINE TO f AT $x=a$
- ☐ GIVEN A PIECEWISE FUNCTIONS WITH SOME UNSPECIFIED PARAMETERS, CHOOSE VALUES FOR THOSE PARAMETERS THAT MAKE THE FUNCTION CONTINUOUS

AVERAGE RATE OF CHANGE.

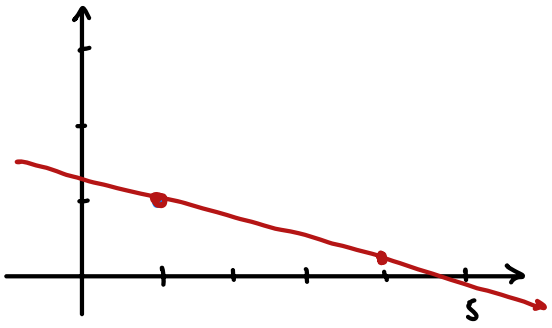
e.g. IF I DROVE 200 MILES IN 4 HOURS MY AVG. SPEED WAS

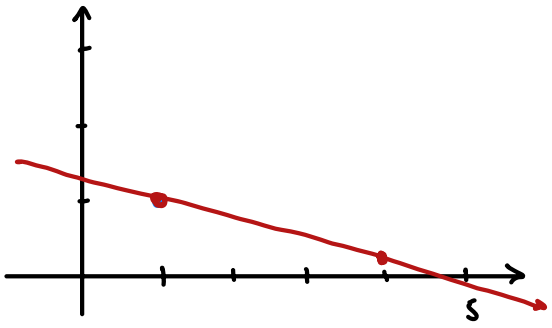
FOR A FUNCTION THE AVG. RATE OF CHANGE FOR $f(x)$ OVER $[a,b]$ IS

e.g. $f(x) = \frac{1}{x}$; $[1,4]$



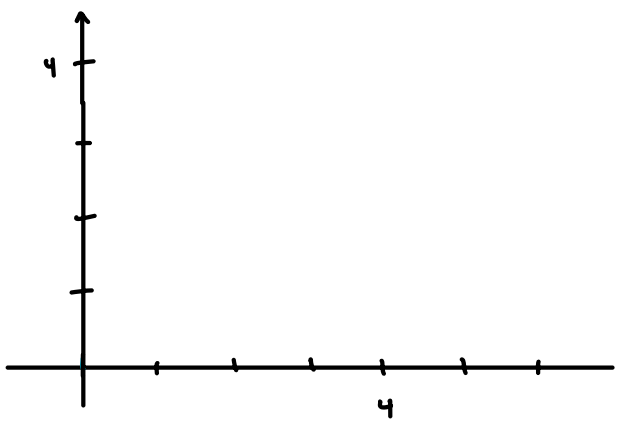
* LOTS OF GRAPHS HAVE THIS SAME SECANT LINE



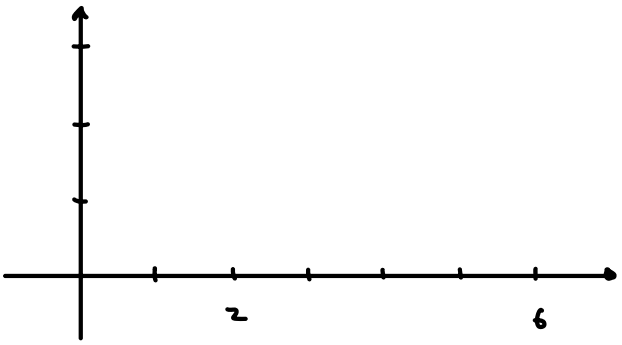


EXAMPLES

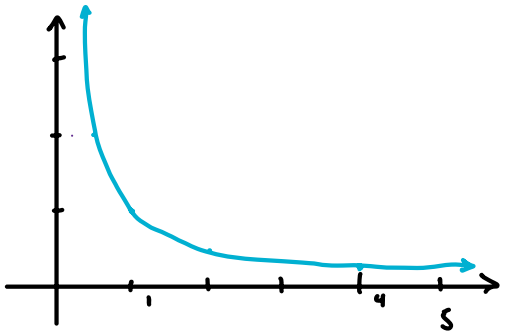
1. COMPUTE THE AVG. RATE OF CHANGE, AND WRITE AN EQUATION FOR THE SECANT LINE FOR $f(x) = 2\sqrt{x}$ FROM $x = 1$ TO $x = 4$.

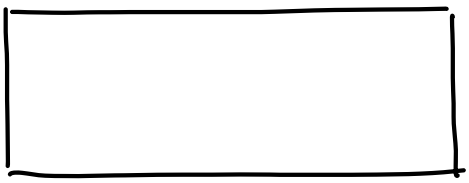


2. DETERMINE THE AVG. RATE OF CHANGE FOR f OVER $[2, 6]$ USING THE GRAPH.



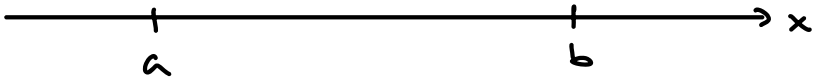
MOVING FROM AVERAGE TO INSTANTANEOUS RATE OF CHANGE:





e.g $f(x) = \frac{1}{x}$; $x = 1$

ALTERNATIVE FORMULA:



$$\lim_{b \to a} \frac{f(b) - f(a)}{b - a} =$$

EX: $f(x) = 2x^2 - 4$; $x = 1$

Ex: $f(x) = \sqrt{x}$; $x = 4$

Ex: $f(x) = x^2 - 2x$ AT $x = 3$