

Source: [KBe-2020math401-index](#)

## Rate of Change (1, chemical reaction)

1. Average rate of change (slope) between  $t = 20$  and  $t = 30$  is 0.615
2.  $f(x) = \frac{(A_0(1-\exp(-k(x+p))) - A_0(1-\exp(-k(x))))}{p}$ 
  1. Show that it looks like the tangent at  $x = 25$ :  $y = f(25)(x - 25) + 51.444$
3. Desmos Graph

## Rate of Change (2, washing machines)

1. Average cost for 100 machines =  $\frac{11000}{100} = 110$
2. Derivative is  $y = -0.2x + 100$ , so we get 80
3. By hard coding the numbers, we get  $(2000 + 100 \cdot 101 - 0.1(101)^2) - ((2000 + 100 \cdot 100 - 0.1(100)^2)) = 79.9$  which is roughly 80
4. Demos Graph

## Terminology

(slide 13 is confusing, see questions.)

## Limits

1. Eq  $\frac{x^3-1}{x-1} \Rightarrow \{x^2 + x + 1 : x \neq 1\}$

## Limits Practice

1.  $\lim_{x \rightarrow 10} 2x + 5 = 25$
  2.  $\lim_{x \rightarrow -2} \frac{x^2 - x - 6}{x - 2} = -5$
  3.  $\lim_{x \rightarrow 4} \frac{x-4}{\sqrt{x}-2} \Rightarrow * \frac{\sqrt{x}+2}{\sqrt{x}+2} \Rightarrow \sqrt{x} + 2 = 4$
  4.  $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ ;  $\sin x = x$  for small  $x$  (SHM), so we can treat it like  $\frac{x}{x}$  #todo
  5.  $\lim_{x \rightarrow 0} \sin \frac{1}{x}$  Keeps changing... Not sure how to evaluate. #todo
  6.  $\lim_{x \rightarrow 2} \lfloor x \rfloor$
-