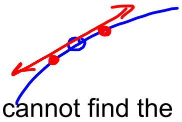
Rates of Change in Rational Functions

Oct 22/2014

Average Rate of Change $\Rightarrow m_{secant} = \dfrac{f(x_2)-f(x_1)}{x_2-x_1}$

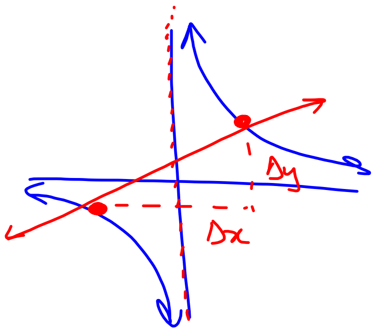
Estimate of Instantaneous Rate of Change $\Rightarrow m_{secant} = \dfrac{f(a+h)-f(a)}{h} \cong m_{tangent}$

Notes:



(1) You cannot find the instantaneous rate of change at a discontinuity (hole or VA). It has no meaning.

(2) While it is possible to determine the average rate of change across a discontinuity, you need to consider whether or not it makes sense to do so.



Oct 17-8:44 AM

Ex.1 Estimate the slope of the tangent to the graph of $f(x)=\dfrac{2x}{x-3}$ at the point where x = 4.

$a=4$

$f(4)=\dfrac{2(4)}{4-3}$

$=8$

$h=0.1$: avg RoC $= \dfrac{f(4.1)-f(4)}{0.1}$

$= \dfrac{\frac{2(4.1)}{4.1-3}-8}{0.1}$

$\doteq -5.45$

$h=0.01$: avg RoC $= \dfrac{f(4.01)-f(4)}{0.01}$

$\doteq -5.941$

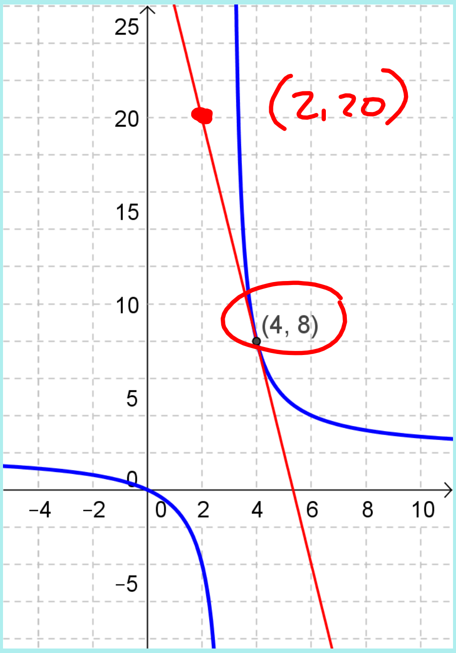
$h=0.001$: avg RoC $\doteq -5.994$

$\doteq -6.0$

Oct 17-9:30 AM

Ex.1 Estimate the slope of the tangent to the graph of

$f(x) = \frac{2x}{x-3}$ at the point where x = 4.



$$m_{tan} = \frac{8-20}{4-2} = \frac{-12}{2} = -6$$

Oct 17-9:30 AM

Assigned Work:

p.303 # 1, 2, 4, 6bc, 10, 13

6(b) $f(x) = \frac{x-6}{x+5}$ VA : $x+5=0$, $x=-5$

$m_{tangent}$ @ $\underbrace{x=-7}_{a=-7}$

$$m = \frac{f(a+h)-f(a)}{h}$$

$h = 0.01$

$$m = \frac{f(-7+0.01)-f(-7)}{0.01} \qquad \frac{f(-7.01)-f(-7)}{-0.01}$$

$$= \frac{f(-6.99)-f(-7)}{0.01}$$

$\doteq -2.74$

no tangent line at discontinuities (holes, VAs)

$\therefore$ tangent line DNE at $x=-5$

"does not exist"

Oct 15-8:11 PM

10. (a) over first 6 months : $t=0$ to $t=6$

$$\text{avg RoC} = \frac{N(6)-N(0)}{6-0}$$

(b) at end of year : $t=12$

$h=0.01$: $$\text{iRoC} \doteq \frac{N(12.01)-N(12)}{0.01}$$

$$= \underline{\qquad\qquad}$$

12.01 is not in domain

$$\text{iRoC} \doteq \frac{N(11.99)-N(12)}{-0.01}$$

$$\doteq \frac{N(12)-N(11.99)}{0.01}$$

$$= \underline{\qquad\qquad}$$

Oct 23-12:41 PM