Rates of Change in Rational Functions Oct 22/2014

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

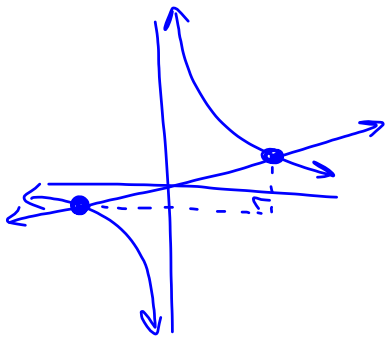
Estimate of Instantaneous Rate of Change $\Rightarrow m_{\text{secant}} = \dfrac{f(a+h)-f(a)}{h}$

secant $\cong$ 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.

$f(4) = \dfrac{2(4)}{4-3} = 8$

Set $h = 0.01$

$m_{sec} = \dfrac{f(4.01)-f(4)}{0.01}$

$= \dfrac{\frac{2(4.01)}{4.01-3} - 8}{0.01}$

$\doteq -5.9406$

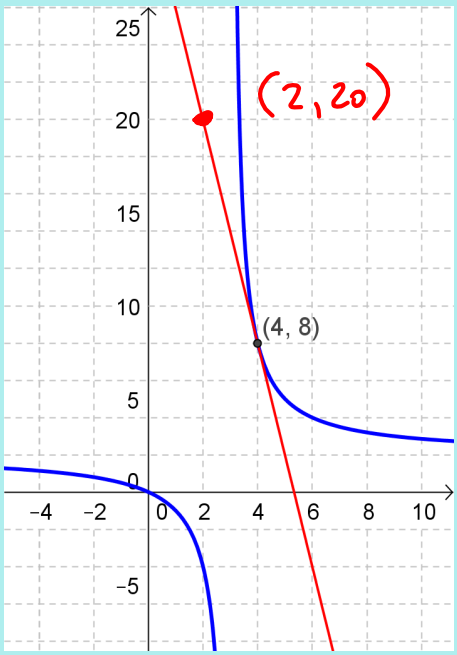
$h = 0.001$

$m_{sec} \doteq -5.994$

$\therefore$ iRoC $\doteq -6$

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.



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

$$= \frac{-12}{2}$$

$$= -6$$

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Assigned Work:

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

6(b) $f(x) = \frac{x-6}{x+5}$

$x+5=0$

$x=-5$

$x=-7$

$(a=-7)$

$h = 0.01$

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

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

$$\doteq 2.76$$

$\frac{f(-7.01) - f(-7)}{-0.01}$

$h = 0.001 \Rightarrow m \doteq 2.75$

no tangent line : VAs or holes

VA : $x = -5$

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6(c) $f(x) = \dfrac{2x^2 - 6x}{3x+5}$

$= \dfrac{2x(x-3)}{3x+5}$ → VA: $3x+5=0$

$3x = -5$

$x = \dfrac{-5}{3}$

no tangent

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10. $N(t) = \dfrac{100t^3}{100+t^3}$ $0 \le t \le 12$ 12.01

(a) from 0 to 6

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

$=$ _____

(b) iRoC for $t = 12$ (months) = 1 year

$h = 0.01$ (less than 1 day)

$\text{avgRoC} = \dfrac{N(12.01) - N(12)}{0.01}$

$\cong$ iRoC

consider domain $0 \le t \le 12$ $h = -0.01$

$\text{avgRoC} = \dfrac{N(11.99) - N(12)}{-0.01}$

$= \dfrac{N(12) - N(11.99)}{0.01}$

$=$ _____

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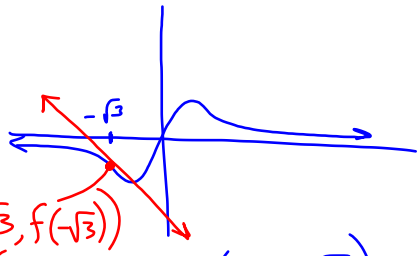
13. $f(x) = \frac{4x}{x^2+1}$



$(-\sqrt{3}, f(-\sqrt{3}))$

at $x = -\sqrt{3}$ $\left(a = -\sqrt{3}\right)$, $h = 0.0001$

$$m_{sec} = \frac{f(-\sqrt{3}+0.0001) - f(-\sqrt{3})}{0.0001}$$

$$= \_\_\_\_\_$$

Sub point

$y = mx + b$ ✓

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