3.2-3.3

Monday, June 15, 2009
7:39 AM

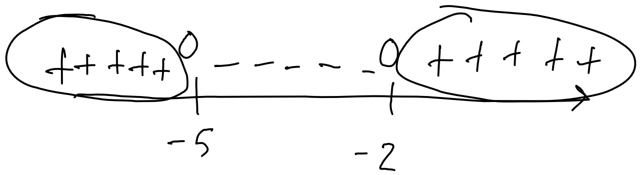
§3.2 continued

Sign Charts — exploit continuity to fill in signs between zeros & discontinuities (V.A.'s)

#30 pg 157 $\quad x^2+7x > -10$

$$x^2+7x+10>0$$

$$(x+5)(x+2)>0$$

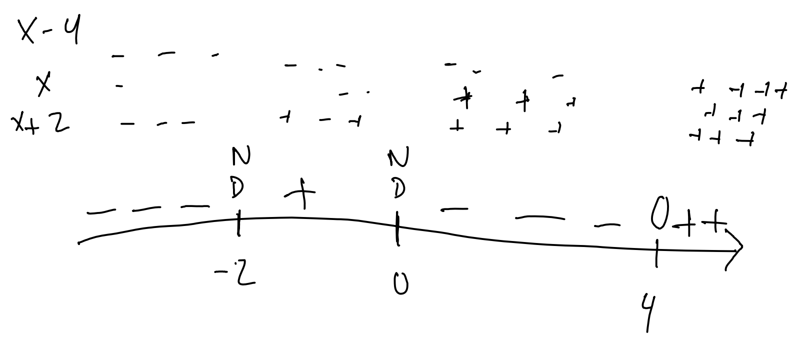


intervals: $(-\infty,-5)$ or $(-2,\infty)$

inequality: $x<-5$ or $x>-2$

#34/p 157 $\quad \dfrac{x-4}{x^2+2x}<0$

$$\frac{x-4}{x(x+2)}<0$$



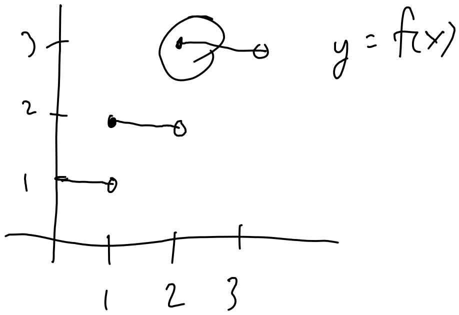
domain $x \neq 0,\ x \neq -2$

int: $(-\infty,-2)$ or $(0,4)$

ineq: $x<-2$ or $0<x<4$

Right/Left Continuity

right continuity.



at $x=2$ this function is not continuous

why? $\lim_{x\to 2} f(x)$ DNE because $\lim_{x\to 2^+} f(x) = 3$ but $\lim_{x\to 2^-} f(x) = 2$

however $f(x)$ is right continuous at $x=2$

$\lim_{x\to 2^+} f(x)$ exists and equals $f(2)$:)

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§3.3 Rates, Slopes, & The Derivative.

Ex. x = # of toy tracks

$p = 20 - .02x$

$R(x) = (\text{qty})(\text{price})$

$= x\,(20 - .02x)$

$\uparrow$ $x=0$ $\qquad \uparrow$ $x = 1000$

intercepts

what is the average rate of change in revenue as x changes from 100 to 400 tracks?

$R(100) = 100(20 - .02(100)) = \$1800$

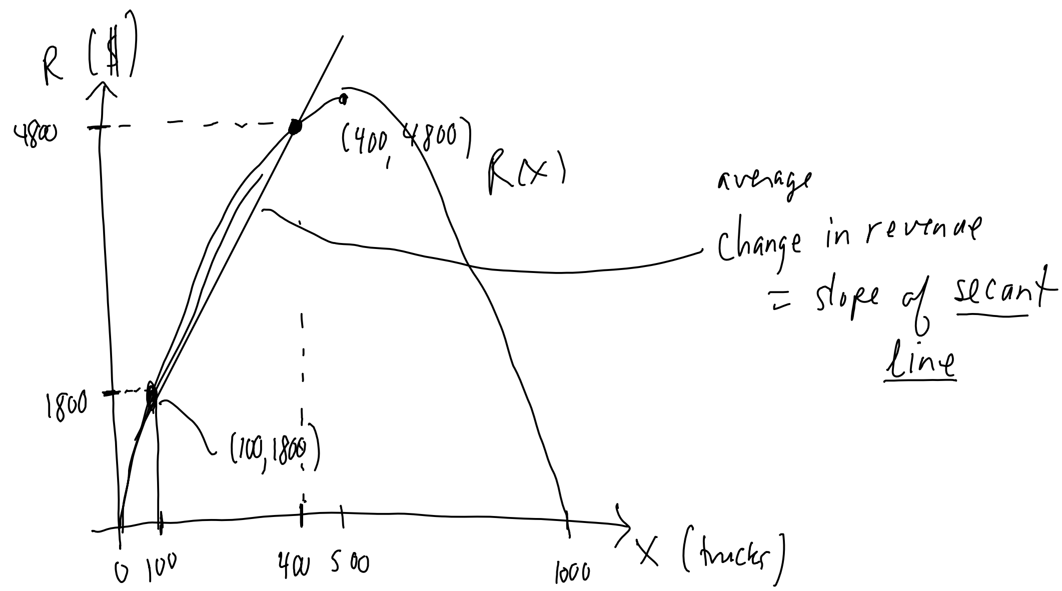
$R(400) = 400(20 - .02(400)) = \$4800$

total change in revenue was \$3000

total change in x was 300 trucks

The revenue increased, on average, $\frac{\$3000}{300} = \$10/\text{truck}$

i.e. $$\frac{\overset{\swarrow \text{dollars}}{R(400) - R(100)}}{\underset{\nwarrow \text{trucks}}{400 - 100}} = \frac{4800 - 1800}{400 - 100} = \frac{3000}{300} = 10 \ \frac{\text{dollars}}{\text{truck}}$$



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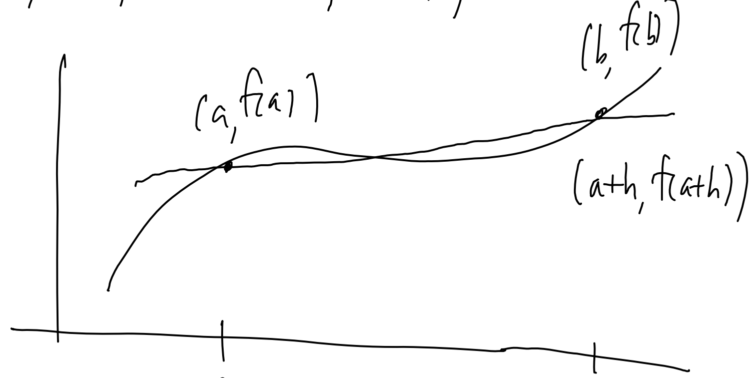
the average rate of change from $x = a$ to $x = b$ is

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

which is also the slope of the secant line connecting $(a, f(a))$ to $(b, f(b))$



a $\underbrace{\qquad\qquad}_{h}$ b

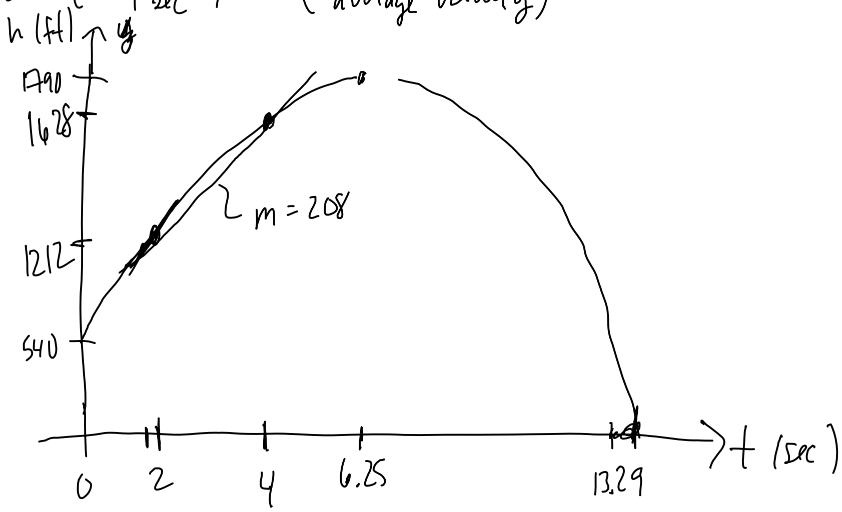
$a+h$

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

Ex. height of rocket (~~meters~~ feet) at t seconds

$$h(t) = -32t^2 + 400t + 540$$

On average, how fast is the rocket's height changing from time $t=2$ sec. to $t=4$ sec? (average velocity)



$h(4) = 1628$ ft

$h(2) = 1212$ ft

avg. rate of change

$$= \frac{h(4)-h(2)}{4-2}\ \frac{ft}{s} = \frac{1628-1212}{4-2} = \frac{416}{2} =$$

$$208\ \frac{ft}{s}$$

want to know exact velocity at the instant when $t = 2$ seconds?

better estimate w/ average from $t = 1.9$ to $t = 2$

$$\text{ave. vel.} = \frac{h(2) - h(1.9)}{2 - 1.9} = \frac{1212 - 1184.48}{2 - 1.9} = 279.2 \frac{\text{ft}}{\text{sec.}}$$

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instaneous velocity at $t = 2$ will be

$$\lim_{h \to 0} \frac{r(2+h) - r(2)}{h}$$

where is $r(t)$ is now the rocket height