MATH 149 Homework 18 Solutions

Sec 3.2 #30 $C(x) = 10\left(\frac{1}{x} + \frac{x}{x+3}\right)$

a) $C(3) = 10\left(\frac{1}{3} + \frac{3}{6}\right) = \frac{50}{6}$

$C(6) = 10\left(\frac{1}{6} + \frac{6}{9}\right) = \frac{50}{60}$ } equal.

b) $C(x)$ is cont. on $[3,6]$, diff. on $(3,6)$ $\Rightarrow$ There is an x in $[3,6)$ such that

$C'(x) = 0 \Rightarrow 10\left(-\frac{1}{x^2} + \frac{1\cdot(x+3) - x\cdot 1}{(x+3)^2}\right) = 0$

$\Rightarrow 10\left(\frac{-(x+3)^2 + 3x^2}{x^2(x+3)^2}\right) = 0 \Rightarrow -(x^2+6x+9) + 3x^2 = 0 \Rightarrow 2x^2 - 6x - 9 = 0$

quadratic formula $\Rightarrow$ $x = \frac{6 \mp \sqrt{36 - 4\cdot 2(-9)}}{2\cdot 2} = \frac{6 \mp \sqrt{108}}{4} = \frac{6 \mp 6\sqrt{3}}{4}$

$\Rightarrow x = \frac{3 \mp 3\sqrt{3}}{2}$ Note that $\frac{3+3\sqrt{3}}{2} = 4.098$ is in $[3,6]$

#38. $f(x) = -x^2 - x + 6$ a) $m = \frac{4-0}{-2-2} = -1 \Rightarrow \boxed{y = -x+2}$ secant line

points $(-2,4)$ and $(2,0)$

b) M.V.T $\Rightarrow$ There's an x in $(-2,2)$ where $f'(x) = -1$ = slope of the secant

$-2x - 1 = -1$

$\Rightarrow \boxed{x = 0}$ $f(0) = 6$.

c) So, equation of the tangent line is $y - 6 = -(x-0) \Rightarrow \boxed{y = -x+6}$

#51. $s(t) = -4.9t^2 + 500$ a) average velocity from $t=0$ to $t=3$ $= \frac{s(3) - s(0)}{3-0} = -14.7$

b) M.V.T $\Rightarrow$ There's a t in $(0,3)$ where $s'(t) = -14.7$

So, $-9.8t = -14.7 \Rightarrow \boxed{t = 1.5}$

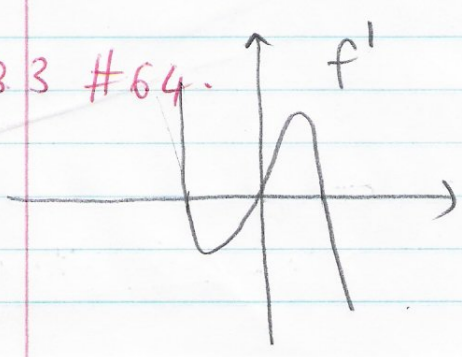
#60. $v(9{:}13) = 35$ m/h

$v(9{:}15) = 85$ m/h

$\Rightarrow$ By the MVT, there's a time t between 9:13 and 9:15 where $v'(t) = \frac{(85-35)}{2 \text{ min}}$

$= \frac{50 \text{ mph}}{\frac{2}{60} \text{ hours}} = 1500 \text{ m/h}^2$ (acceleration)

Sec 3.3 #64.



$\rightarrow$ sign chart for f'

x	-2		-1		0		1		2
$f'(x)$		$+$	0	$-$	0	$+$		$-$	
f		increasing	local max	dec.	local min	inc.	local max	dec.	