Learning Goal Check!

For the curve $f(x) = 2x^3 - 12x^2 + 59$ show that there is a local extremum when $x = 4$, and determine whether it is a maximum or a minimum.

$$(a+b)^3 = 1a^3 + 3a^2b + 3ab^2 + 1b^3$$

$$(2x+4)^3 = (2x)^3 + 3(2x)^2(4) + 3(2x)(4)^2 + 4^3$$

$f(x) = 2x^3 - 12x^2 + 59$ at $x=4$

$$m = \frac{f(x+h) - f(x)}{h}, \quad h \to 0$$

$$= \frac{2(x+h)^3 - 12(x+h)^2 + \cancel{59} - 2x^3 + 12x^2 - \cancel{59}}{h}, \quad h \to 0$$

$$= \frac{2(x^3 + 3x^2h + 3xh^2 + h^3) - 12(x^2 + 2xh + h^2) - 2x^3 + 12x^2}{h}, \quad h \to 0$$

$$= \frac{\cancel{2x^3} + 6x^2h + 6xh^2 + 2h^3 - \cancel{12x^2} - 24xh - 12h^2 - \cancel{2x^3} + \cancel{12x^2}}{h} \quad h \to 0$$

$$= \frac{2h^3 + 6x^2h + 6xh^2 - 24xh - 12h^2}{h}, \quad h \to 0$$

$$= 2h^2 + 6x^2 + 6xh - 24x - 12h, \quad h \to 0$$

$m = 6x^2 - 24x$

at $x=3.9$	at $x=4$	at $x=4.1$
$6(3.9)^2 - 24(3.9)$	$6(4)^2 - 24(4)$	$6(4.1)^2 - 24(4.1)$
$= -2.34$	$= 6(16)$	$= 2.46$
	$= 96 - 96$	
	$= 0$	

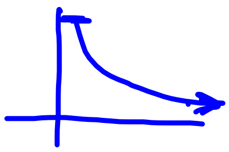
$\therefore$ minimum at $x=4$ (negative slope to positive)

Questions?

9a.

14.

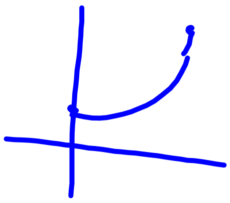
9a) i) $y=100(0.85)^t$ $\quad 0 \le t \le 5$



max: $t=0$ $\quad (0,100)$

min: $t=5$

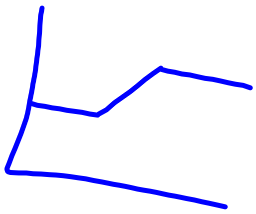
ii) $y=35(1.15)^x$ $\quad 0 \le x \le 10$



max: $x=10$

min: $x=0$ $\quad (0,35)$

14)



Review Questions

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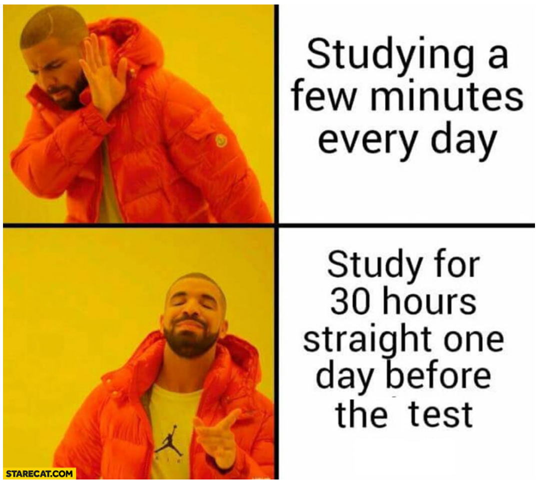
2, 3, 5 (an estimate is required only), 6a(find the quadratic equation first then use the preceding interval method), 8, 9, 10, 11ab(use the first principles), 13

pg. 118 (45 minutes max)

#1, 2, 3, 4a(use the first principles)



Topics :

- average rate of change
- instantaneous rate of change
- local min/max
- applications