# 3.4 #31 HW

(#31) iPhone Sales (Pg 234)

Data points:

| | | |
|---|---|---|
| (2,270) | Quarter 2 | 2007 |
| (3,1120) | Quarter 3 | 2007 |
| (4,2315) | Quarter 4 | 2007 |
| (5,1700) | Quarter 1 | 2008 |
| (6,720 | Quarter 2 | 2008 |

1st set of 2 quarter intervals
2nd set of 2 quarter intervals
3rd set of 2 quarter intervals

Quarters 2 & 4 (2007) $m = \frac{\Delta y}{\Delta x}$ Using data points (4,2315) and (2,270)

$$m = \frac{2315 - 270}{4 - 2} = 1022.50 \quad \{\text{Greatest}\}$$

Quarters 3 and 5 (2007) (2008) $m = \frac{\Delta y}{\Delta x}$ using data points (5,1700) and (3,1120)

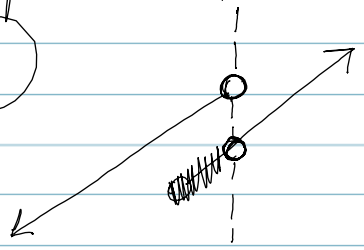
$$m = \frac{1700 - 1120}{5 - 3} = 290$$

Quarters 4 and 6 (2007) (2008) $m = \frac{\Delta y}{\Delta x}$ using data points (6,720) and (4,2315)

$$m = \frac{720 - 2315}{6 - 4} = -797.50 \quad \{\text{Least}\}$$

Upper Review: #14 and #28

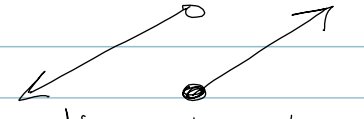
(#14)



Function value has to = limit value

Limit from left has to = limit from right
No breaks, gaps, or jumps

i.e.

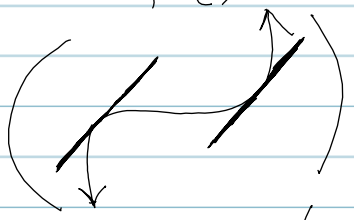


= discontinuity, not differential b/c of solid circle.

To be differential:
lim, , , - and
tl , ,

#28 Tangent line with $m = 1$

$f'(x) = 1$ Function $f(x) = \frac{1}{3}x^3 - \frac{1}{2}x^2 + x$




$\boxed{f'(x) = x^2 - x + 1}$

$y'$ same as $f'(x)$, so $x^2 - x + 1 = 1$
$-1 \quad -1$

$x^2 - x = \emptyset$

$x(x-1) = \emptyset$

Plug into Original equation $\begin{cases} x = \emptyset \\ x = 1 \end{cases}$

$x = \emptyset$

$\frac{1}{3}x^3 - \frac{1}{2}x^2 + x$

$y = \frac{1}{3}(\emptyset)^3 - \frac{1}{2}(\emptyset)^2 + \emptyset$

$y = \emptyset - \emptyset + \emptyset = \emptyset$

$\boxed{(\emptyset, \emptyset)}$

$x = 1$

$\frac{1}{3}x^3 - \frac{1}{2}x^2 + x$

$\frac{1}{3}(1)^3 - \frac{1}{2}(1)^2 + 1$

$y = \frac{2}{6} - \frac{3}{6} + \frac{6}{6} = \frac{5}{6}$

$\boxed{\left(1, \frac{5}{6}\right)}$

2 data points

**Lower Review: #11, #13, and #16**

(11) $f(x) = 4x^2 - 6x$ ; $a = 7$ Interval $[a, a+h]$

$h = 2$; 0.2; 0.02, 0.002, and 0.0002

$h$ = distance between 2 points

**Step 1:** $\lim_{h \to \emptyset} \frac{f(x+h) - f(x)}{h}$

**Step 2** $a = 7$, $h = 2$ $[a, a+h]$ $[7, 9]$

$\frac{f(a+h) - f(a)}{h} = \frac{f(9) - f(7)}{2}$

$f(7) = 4(7)^2 - 6(7) = 154$

$f(9) = 4(9)^2 - 6(9) = 270$

**Step 3** Plug this data into Calculator

Cont #11 Lower Review $f(9) = 4(9)^2 - 6(9) = 270$
$f(7) = 4(7)^2 - 6(7) = 154$

$= \frac{(270-154)}{2} = 58$

next interval: $a=7$, $h=0.2$ $[7, 7.2]$

$f(7.2) = 4(7.2)^2 - 6(7.2) = 164.16$
$f(7) = 154$

(DQ) Difference Quotient $= \frac{f(7.2)-f(7)}{0.2} = \frac{164.16-154}{0.2} = 50.8$

3rd interval: $a=7$, $h=0.0002$ $[7, 7.0002]$

$\frac{f(7.0002)-f(7)}{.0002}$ $f(7.0002) = 4(7.0002)^2 - 6(7.0002) = 154.0100002$
$f(7) = 154$

Difference Quotient $= \frac{154.0100002-154}{0.0002} = 50.0008$

Shortcut $= f'(x) = 8x-6$

$f'(7) = 8(7)-6 = 50$

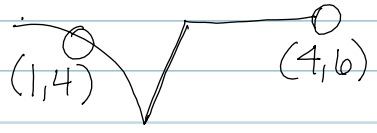
Interval: $[1, 4]$

#13 Rate of $\Delta$ $(4, 6)$ $\pm$
$(1, 5)$ $\pm$

$\frac{\Delta y}{\Delta x}$ = slope $= \frac{6-5}{4-1} = \frac{1}{3}$

Redo $(4, 6)$ and $(1, 4)$

$\frac{\Delta y}{\Delta x} = \frac{6-4}{4-1} = \frac{2}{3}$



#16 $f(x) = 2\sqrt{x}$ or $2x^{\frac{1}{2}}$

$f'(x) = 2\left(\frac{1}{2}\right)x^{\left(\frac{1}{2}-1\right)} = 1x^{-\frac{1}{2}} = x^{-\frac{1}{2}} = \frac{1}{\sqrt{x}}$

when $x = 16$ $\quad f'(16) = \frac{1}{\sqrt{16}} = \frac{1}{4}$ slope

only use → original equation to find data points (only)

$f'(16) = 2\sqrt{16} = 2(4) = 8$

$(16, 8)$ Data point

Use formula: point-slope form $(y - y_1 = m(x - x_1))$

, so $y - 8 = \frac{1}{4}(x - 16)$

$y - 8 = \frac{1}{4}x - 4$

$+8 \qquad +8$

$\boxed{y = \frac{1}{4}x + 4}$