3.4 #31 HW

#31 iPhone Sales (Pg 234)

1st set of 2 quarter intervals:
(2,310) Quarter 2 2007
(3,1120) Quarter 3 2007
(4,2315) Quarter 4 2007
(5,1700) Quarter 1 2008
(6,720) Quarter 2 2008

2nd set of 2 quarter intervals:
(3,1120) 2007
(4,2315) 2007
(5,1700) 2008
(6,720) 2008

3rd set of 2 quarter intervals:

Quarters 2 and 4 (2001)
\[ m = \frac{\Delta y}{\Delta x} \] using data points (4,2315) and (2,310)
\[ m = \frac{2315-310}{4-2} = 1022.50 \] 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)
\[ m = \frac{720-2315}{6-4} = -797.50 \] 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

To be differential @ lin. i.e., at = discontinuity, not
differential
ble of solid circle.
Tangent line with $m=1$

$$f'(x) = 1$$

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

Graph looks like this

$$f'(x) = x^2 - x + 1$$

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

$\frac{\left(x^3 - \frac{1}{2}x^2 + x\right)}{3} = 1$

$\frac{\left(x^3 - \frac{1}{2}x^2 + x\right)}{3} = 1$

$y = \frac{\left((0)^3 - \frac{1}{2}(0)^2 + 0\right)}{3} + \emptyset = \emptyset$

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

$\emptyset = \emptyset - \frac{2}{3} + \frac{4}{6} = \frac{2}{3}$

Plug into original equation:

$x = \emptyset$

$x = 1$

$\frac{\left(1\right)^3 - \frac{1}{2}(1)^2 + 1}{3} = \frac{5}{6}$

2 data points

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

#11 $f(x) = 4x^2 - 6x$; $a = 7$

Interval $[a, a + h]$ $h = 2, 0.2, 0.02, 0.002$

Step 1: $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$

Step 2: $a = 7$, $\frac{[a, a + h]}{[7, 9]}$

$\frac{f(x+h) - f(x)}{h} = f'(9)$

$\frac{f(9) - f(7)}{2}$

Step 3: Plug this data into calculator

$\frac{f(9) - f(7)}{2} = \frac{154}{2} = 77$

$f(9) = 4(9)^2 - 6(9) = 154$
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: \[ a = 7 \]
\[ h = 0.2 \] \[ [7, 7.2] \]

\[ P(7.2) = 4(7.2)^2 - 6(7.2) = 164.16 \]
\[ f(7) = 154 \]

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

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

\[ f(7.0002) - f(7) = \frac{f(7.0002) = 4(7.0002)^2 - 6(7.0002)}{f(7) = 154} \]

Difference Quotient = \[ \frac{154.0100002 - 154}{0.0002} = 50,000.8 \]

Shortcut = \[ f'(x) = 8x - 6 \]
\[ f'(7) = 8(7) - 6 = 50 \]

#13 Rate of \( \Delta \)
(4, 6) \( \pm \)
(1, 5) \( \pm \)
\[ \frac{\Delta y}{\Delta x} = \text{slope} = \frac{6 - 5}{4 - 1} = \frac{1}{3} \]

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

\[ \frac{\Delta y}{\Delta x} = \frac{6 - 4}{4 - 1} = \frac{2}{3} \]
\#16 \quad f(x) = 2\sqrt{x} \quad \text{or} \quad 2x^{\frac{1}{2}}

\quad 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} \quad \text{slope}

only use original equation to find data points

\quad \text{(only)} \quad f'(16) = 2\sqrt{16} = 2(4) = 8

\quad (16, 8) \quad \text{Data point}

Use formula\textsuperscript{2} point-slope form \((y-y_1) = m(x-x_1)\)

\quad \text{SO} \quad y-8 = \frac{1}{4}(x-16)

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

\quad +8 \quad +8

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