201 §2.1 #s 18, 20

18) $F(x) = \frac{x+2}{x-2}$, $x = 1.2, 1.1, 1.01, 1.001, 1.0001, 1$

(a) Find m_{AVG} for F on $[1, x]$, using a table

x	$F(x)$	m_{AVG} on $[1,x]$
1	-3	$\nexists$
1.2	-4	-5
1.1	-3.444	-4.444
1.01	-3.04	-4.04
1.001	-3.004	-4.004
1.0001	-3	-4
1.0001	-3.0004	-4.0004

(b) By this work, we guess that the rate of change @ $x=1$ is $\boxed{f'(1) = -4}$

20) Let $f(t) = \frac{1}{t}$ for $t \neq 0$

(a) Find AVG Rate of change of f w.r.t. t

over

(i) $[2,3]$: $\dfrac{\frac{1}{3} - \frac{1}{2}}{3-2} = \dfrac{\frac{2-3}{6}}{1} = \boxed{-\frac{1}{6} = m_{AVG}}$

(ii) $[2,T]$: $\dfrac{\frac{1}{T} - \frac{1}{2}}{T-2} = \dfrac{\frac{2-T}{2T}}{T-2} = \dfrac{2-T}{2T(T-2)}$

$= \dfrac{-(T-2)}{2T(T-2)} = \boxed{-\frac{1}{2T} = m_{AVG}}$

201 §2.1 #s 2, 6, 8, 14, 18, 20

#s 1–6 Find average rate of change over the given interval.

(2) $g(x) = x^2$

(a) $[a,b] = [-1,1] \Rightarrow \frac{g(b)-g(a)}{b-a} = \frac{g(1)-g(-1)}{1-(-1)}$

$= \frac{1^2-(-1)^2}{2} = \frac{0}{2} = \boxed{0} = m_{avg}$

(b) $[a,b] = [-2,0] \Rightarrow \frac{g(b)-g(a)}{b-a} = \frac{0^2-(-2)^2}{0-(-2)} = \frac{-4}{2} = \boxed{-2}$

$= m_{avg}$

(6) $f(\theta) = \theta^3 - 4\theta^2 + 5\theta$; $[1,2] \Rightarrow$

$\frac{f(2)-f(1)}{2-1} = \frac{2^3-4(2)^2+5(2) - (1^3-4(1)^2+5(1))}{1}$

#8

$= 8-16+10-(1-4+5) = 2-(2) = \boxed{0 = m_{avg}}$

#s 7–14 Use method of Example 3 to find

(a) the slope of the curve @ P and

(b) " eq'n of the tangent line @ P.

Sketch; $\lim_{h \to 0} \frac{f(a+h)-f(a)}{h} = m$, then

$y = m(x-a) + f(a)$

201 §2.1 #s 8, 14, 18, 20

8 $y = 5 - x^2 = f(x)$, $P(1,4)$

#18 (a) $\dfrac{f(1+h)-f(1)}{h} = \dfrac{5-(1+h)^2-(5-1^2)}{h}$

$= \dfrac{5-(1+2h+h^2)-(5-1)}{h} = \dfrac{5-1-2h-h^2-4}{h}$

$= \dfrac{-2h-h^2}{h} = -2-h \xrightarrow{h \to 0} \boxed{-2 = m_{tan}}$

This is actually $f'(1)$

(b) $y = m(x-x_1)+f(x_1)$

$y = -2(x-1)+4 = -2x+2+4$
$= -2x+6$

In gen'l, for these:
$L(x)$ = Linearization = $f'(x_1)(x-x_1)+f(x_1)$
is the tangent line equation.

14 $y = x^3-3x^2+4$; $P(2,0)$

(a) $\dfrac{f(2+h)-f(2)}{h} = \dfrac{(2+h)^3-3(2+h)^2+4-(2^3-3(2)^2+4)}{h}$

$= \dfrac{2^3+3\cdot 2^2\cdot h+3\cdot 2\cdot h^2+h^3-3(2^2+2\cdot 2h+h^2)+4-(0)}{h}$

$= \dfrac{8+12h+6h^2+h^3-12-12h-3h^2+4}{h}$

$= \dfrac{12h+6h^2+h^3-12h-3h^2}{h} = \dfrac{h^3+3h^2}{h} = h^2+3h \xrightarrow{h \to 0} \boxed{0 = m}$

(b) $y = 0(x-2)+0 = 0$; i.e., $\boxed{y=0}$