HW 1-9 page 1

2.1
p 107 1, 11, 15, 17, 25, 27, 31, 39, 43, 45-47, 53

① Tangent line: find slope $\dfrac{f(x+h)-f(x)}{(x+h)-x}$

then let $h \to 0$ $\lim_{h\to 0} \dfrac{f(x+h)-f(x)}{h}$ (p 103)

⑪* $f(x) = 2x^2 - 3$ slope at $(2,5)$

$$\lim_{h\to 0} \frac{2(x+h)^2 - 3 - (2x^2-3)}{h} = \lim_{h\to 0} \frac{2x^2 + 4xh + 2h^2 - 3 - 2x^2 + 3}{h}$$

$$= \lim_{h\to 0} 4x + 2h = 4x$$

@ $(2,5)$ $m = 4(2) = 8$

⑮ $f(x) = 7$ $\lim_{h\to 0} \dfrac{7-7}{h} = 0$

⑰ $f(x) = -5x$ $\lim_{h\to 0} \dfrac{-5(x+h) - (-5x)}{h} = \lim_{h\to 0} \dfrac{-5x - 5h + 5x}{h} = -5$

㉕ $f(x) = \dfrac{1}{x-1}$ $\lim_{h\to 0} \dfrac{1}{h}\left(\dfrac{1}{x+h-1} - \dfrac{1}{x-1}\right)$

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

$$\lim_{h\to 0} \frac{-h}{h(x+h-1)(x-1)} = \frac{-1}{(x-1)^2}$$

㉗ $f(x) = \sqrt{x+4}$ $\lim_{h\to 0} \left(\dfrac{\sqrt{x+h+4} - \sqrt{x+4}}{h}\right) \dfrac{(\sqrt{x+h+4} + \sqrt{x+4})}{(\sqrt{x+h+4} + \sqrt{x+4})}$

$$\lim_{h\to 0} \left(\frac{(x+h+4) - (x+4)}{h(\sqrt{x+h+4} + \sqrt{x+4})}\right)$$

$$\lim_{h\to 0} \frac{h}{h(\sqrt{x+h+4} + \sqrt{x+4})} = \frac{1}{2\sqrt{x+4}}$$

HW 1-9 page 2

31* $f(x) = x^3$ tangent line eq. @ $(2,8)$

$$m = \lim_{h\to 0} \frac{(x+h)^3 - x^3}{h} = \lim_{h\to 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$$

$$= \lim_{h\to 0} 3x^2 + 3xh + h^2 = 3x^2 \text{ so } y - 8 = 3(2)^2(x-2)$$

$$y - 8 = 12(x-2)$$

39. $f(x) = x^3$

$f'(x) = 3x^2$ from #31 Slope when parallel to $3x - y + 1 = 0$ is 3

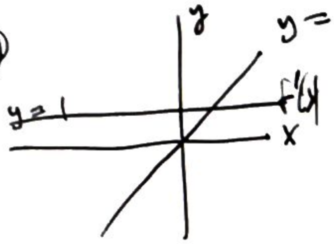
So $3x^2 = 3$

$x = 1$ or -1

$y - 1 = 3(x-1)$

$y + 1 = 3(x+1)$

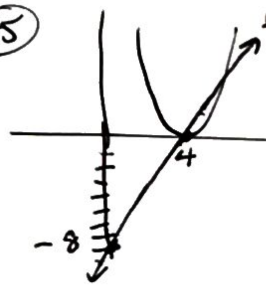
43



Slope is always 1

$\cdot\ y = 1$

45

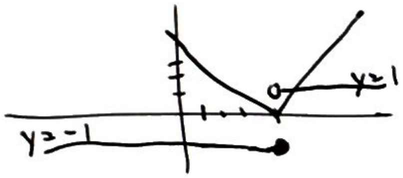


$f = (x-4)^2$

$f' = 2x - 8$

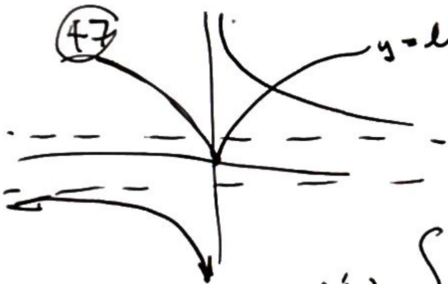
slope is 0 @ $x = 4$

46 $f(x) = |x-4| = \begin{cases} -(x-4), & x \le 4 \\ x-4, & x > 4 \end{cases}$



$$f'(x) = \begin{cases} -1, & x \le 4 \\ 1, & x > 4 \end{cases}$$

47



$$f'(x) = \begin{cases} \frac{1}{x} + 1 \\ \frac{1}{x} - 1 \end{cases}$$

53 The tangent line to $y = h(x)$ @ $(-1,4)$ passes through $(3,6)$

find $h(-1)$ & $h'(-1)$

$$m = \frac{4-6}{-1-3} = \frac{1}{2} = h'(-1)$$

and $h(-1) = 4$.