P. 104

Find the slope of the tangent line

(6) $g(x) = 3/2x + 1$ at $(-2,-2)$

slope $= 3/2$

(26) Find the EQ of the tangent line

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

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

$$\frac{\cancel{x^2} + 2x\Delta x + \Delta x^2 + \cancel{3x} + 3\Delta x + \cancel{4} - \cancel{x^2} - \cancel{3x} - \cancel{4}}{\Delta x}$$

$$\frac{\cancel{\Delta x}(2x + \Delta x + 3)}{\cancel{\Delta x}} = 2x + 3 \text{ at } x = -2$$

$= 2(-2) + 3$

$= -1$

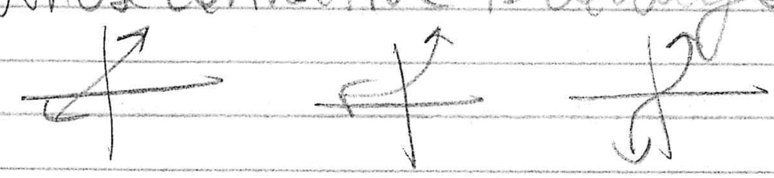
$y - 2 = -1(x + 2)$

$y - 2 = -x - 2 \Rightarrow y = -x$

(44) The tangent line to $y = h(x)$ at $(-1, 4)$ passes through $(3, 6)$. Find:

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

(52) Sketch a graph of a function whose derivative is always positive.



(64) a) $g(0) = -3$ → negative slope

b) $g'(3) = 0$ → zero slope

c) negative slope

d) positive slope

e) positive → $g(6) > g(4)$ due to + slope

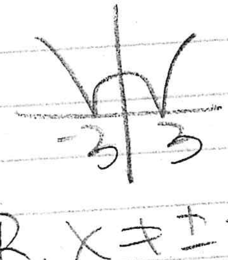
f) no

To be differentiable, a function must:

- be continuous
- be smooth → no sharp corners!
  - same slope and not vertical

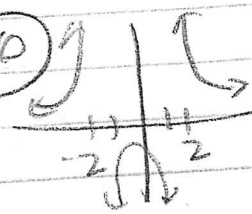
Identify the values at which f is differentiable (can be differentiated)

(84)



$\mathbb{R}, x \neq \pm 3$

(86)



$\mathbb{R}, x \neq \pm 2$

(88)

$\mathbb{R}, x \neq 0$

Is the function differentiable at $x=1$?

(96) $f(x) = \begin{cases} x & x \leq 1 \\ x^2 & x \geq 1 \end{cases}$ top bottom

- be continuous: $f(1)=1$ $f(1)=1$
- have the same slope: top slope $= 1$

bottom slope $= 2x$ at $x=1$ $= 2$

Not differentiable

(8) Find the slope of the tangent line.

$y = 6 - x^2$ at $(1,5)$

$$\lim_{h \to 0} \frac{6-(x+h)^2 - (6-x^2)}{h}$$

$$\lim_{h \to 0} \frac{6-(x^2+2xh+h^2) - 6 + x^2}{h}$$

$$\lim_{h \to 0} \frac{6 - x^2 - 2xh - h^2 - 6 + x^2}{h}$$

$$\lim_{h \to 0} \frac{-2xh - h^2}{h}$$

$$\lim_{h \to 0} -2x - h$$

$-2x - 0$

$-2x$

at $(1,5)$

$-2(1)$

-2