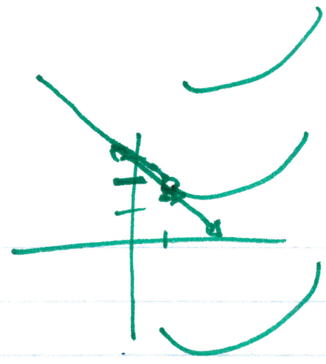
3.2

39 $f(x) = \begin{cases} 3-x, & x<1 \\ ax^2+bx, & x \geq 1 \end{cases}$



(a) $3-1=2$

$a(1)^2+b(1) \rightarrow ax^2+bx=2$

$a(1)^2+b(1)=2$

$-1 \quad (\boxed{a+b=2})$

(b) $\lim_{h\to 0^-} \frac{3-(1+h)-2}{h}$

$\lim_{h\to 0^-} \frac{-h}{h} = \lim_{h\to 0^-} -1 = -1$

$\lim_{h\to 0^+} \frac{[a(1+h)^2+b(1+h)]-[a+b]}{h}$

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

$\lim_{h\to 0^+} \frac{\cancel{a}+2ah+ah^2+\cancel{b}+bh\cancel{-a}\cancel{-b}}{h}$

$\lim_{h\to 0^+} \frac{\cancel{h}(2a+ah+b)}{\cancel{h}}$

$\boxed{2a+b=-1}$

$-a-b=-2$

$a=-3$

$a+b=2$

$-3+b=2$

$b=5$

31 $f(x) = \frac{x^3-8}{x^2-4x-5} = \frac{x^3-8}{(x-5)(x+1)}$

$x-5=0 \qquad x+1=0$

$x=5 \qquad x=-1$

$(-\infty,-1) \cup (-1,5) \cup (5,\infty)$

3.2

③ $$\lim_{h\to 0^-} \frac{\sqrt{1+h}-1}{h} \cdot \frac{\sqrt{1+h}+1}{\sqrt{1+h}+1} = \lim_{h\to 0^-} \frac{\cancel{1}+h-\cancel{1}}{h\left(\sqrt{1+h}+1\right)}$$

$$\lim_{h\to 0^-} \frac{\cancel{h}}{\cancel{h}\left(\sqrt{1+h}+1\right)} = \lim_{h\to 0^-} \frac{1}{\sqrt{1+h}+1} = \boxed{\frac{1}{2}}$$

$$\lim_{h\to 0^+} \frac{\left[2(1+h)-1\right]-1}{h} = \lim_{h\to 0^+} \frac{\cancel{2}+2h-\cancel{1}-\cancel{1}}{h}$$

$$\lim_{h\to 0^+} \frac{2\cancel{h}}{\cancel{h}} = \lim_{h\to 0^+} 2 = \boxed{2}$$

3.2

(3) $y = \begin{cases} \sqrt{x}, & x < 1 \\ 2x-1, & x \geq 1 \end{cases}$

$$\lim_{h\to 0^-} \frac{\sqrt{1+h}-1}{h} \cdot \frac{\sqrt{1+h}+1}{\sqrt{1+h}+1}$$

$$\lim_{h\to 0^-} \frac{\cancel{1}+\cancel{h}\cancel{-1}}{\cancel{h}(\sqrt{1+h}+1)}$$

$$\lim_{h\to 0^-} \frac{\cancel{h}}{\cancel{h}(\sqrt{1+h}+1)}$$

$$\lim_{h\to 0^-} \frac{1}{\sqrt{1+h}+1} = \frac{1}{2}$$

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

$$\lim_{h\to 0^+} \frac{\cancel{2}+2h\cancel{-1}\cancel{-1}}{h}$$

$$\lim_{h\to 0^+} \frac{2h}{h}$$

$$\lim_{h\to 0^+} 2 = 2$$