3.2

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

(a) $3-1 = a(1)^2+b(1)$

$2 = a+b$

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

$\lim_{h\to 0^-} \frac{3-1-h-2}{h}$

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

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

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

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

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

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

$a+b=2$

$a=2-b$

$2a+b=-1$

$2(2-b)+b=-1$

$4-2b+b=-1$

$4-b=-1$

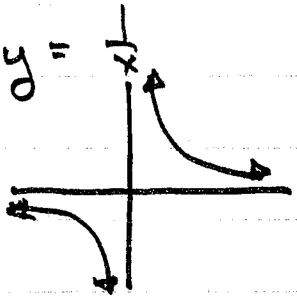
$-b=-5$

$b=5 \rightarrow a=2-5=-3$

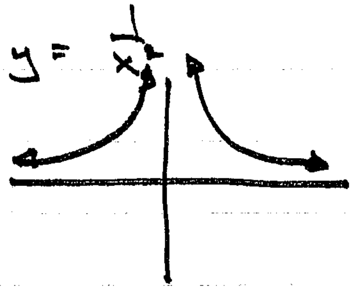
$\boxed{a=-3,\ b=5}$

3.2

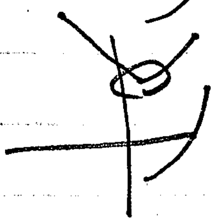
38 $y = \frac{1}{x}$



$y = \frac{1}{x^2}$



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



$\boxed{2 = a+b} \leftarrow \quad b = 2-a$

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

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

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

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

$2a+b = -1$

$2a + (2-a) = -1$

$a + 2 = -1$

$a = -3$

$b = 2-(-3)$

$b = 5$

3.2

4) $f(x) = \begin{cases} x, & x < 1 \\ \frac{1}{x}, & x \geq 1 \end{cases}$ $\quad f(1) = 1$

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

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

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

$\cancel{1} - h - \cancel{1}$

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

$$\lim_{h \to 0^+} \frac{-\cancel{h}}{1+h} \cdot \frac{1}{\cancel{h}} = -\frac{1}{1+h} = \boxed{-1}$$

21) $f'(x) = 3x^2 - 4$

$f'(-2) = 3(-2)^2 - 4 = 8$

3.2 $\sqrt{1}=1$ $\qquad 2(1)-1=1$

3| $y=\sqrt{x}$ $\quad (1,1)$ $\quad y=2x-1$

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

$\lim_{h\to 0}\frac{\sqrt{1+h}-1}{h}\cdot\frac{\sqrt{1+h}+1}{\sqrt{1+h}+1}$ $\qquad \lim_{h\to 0}\frac{\cancel{2}+2h\cancel{-1}\cancel{-1}}{h}$

$\lim_{h\to 0}\frac{\cancel{1}+h\cancel{-1}}{h(\sqrt{1+h}+1)}$ $\qquad \lim_{h\to 0}\frac{2\cancel{h}}{\cancel{h}}$

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

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

31| $f(x)=\frac{x^3-8}{x^2-4x-5}$ $\qquad x^2-4x-5=0$

$(x-5)(x+1)=0$

$\mathbb{R}$ except 5, −1 $\qquad x=5,-1$

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

$\tan^2 x$ $\qquad u=\tan x$

$du=\sec^2 x$

$(\tan x)^2$

$2(\tan x)^1[\sec^2 x]$ $\qquad u^2$

$2u\,du$