1-9 plug in
10-18 sign analysis
19-23 factor
24-39 simplify

40-47 ∞
48-51 $\sqrt{\ }$
52-60 $| \ |$
61-63 plug in

3.3 Strategies for Evaluating Limits P.138 1-63

1. $\lim\limits_{x \to -1} x^3 - x^2 - x$
$= (-1)^3 - (1)^2 - (-1)$
$= -1 - 1 + 1$
$= -1$

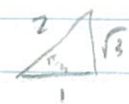
2. $\lim\limits_{x \to 6} \dfrac{x^2+36}{x+3}$
$= \dfrac{(6)^2+36}{6+3}$
$= \dfrac{72}{9} = 8$

3. $\lim\limits_{x \to -2} \dfrac{x^2-2x-8}{2x+1}$
$= \dfrac{(-2)^2 - 2(-2) - 8}{2(-2)+1}$
$= \dfrac{4+4-8}{-3} = \dfrac{0}{-3} = 0$

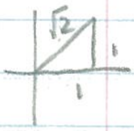
4. $\lim\limits_{x \to 3} \dfrac{2^{x-4}}{x-1}$
$= \dfrac{2^{3-4}}{3-1}$
$= \dfrac{2^{-1}}{2} = \dfrac{1}{4}$

5. $\lim\limits_{x \to 5} x$
$= 5$

6. $\lim\limits_{x \to -4} 8$
$= 8$



7. $\lim\limits_{x \to \frac{\pi}{4}} \sin^2 x$



$= \left(\sin \frac{\pi}{4}\right)^2$
$= \left(\dfrac{1}{\sqrt{2}}\right)^2 = \dfrac{1}{2}$

8. $\lim\limits_{x \to 8} \left[(\log_2 x)(2^{10-x})\right]$
$= (\log_2 8)(2^{10-8})$
$= (3)(4)$
$= 12$

9. $\lim\limits_{x \to \frac{\pi}{3}} \left[\dfrac{3x}{\pi}(\tan^4 x)\right]$
$= \dfrac{3(\frac{\pi}{3})}{\pi}\left[\left(\tan\frac{\pi}{3}\right)^4\right]$
$= 1\left(\dfrac{\sqrt{3}}{1}\right)^4 = 9$

10. $\lim\limits_{x \to 2^+} \dfrac{x+4}{x-2} = \infty$

$- - - 0 + + + + + (x+4)$
$- - - - - 0 + + + (x-2)$
$+ + + \,{-4}\, - - - \,2\, + + +$
∞

11. $\lim\limits_{x \to 2^-} \dfrac{x+4}{x-2}$
$= -\infty$

12. $\lim\limits_{x \to 2} \dfrac{x+4}{x-2}$
does not exist.

13. $\lim\limits_{x \to -2^-} \dfrac{x}{(x+2)^3} = \infty$

$- - - - - 0 + + \ (x)$
$- - - 0 + + + \ (x+2)$
$- - - 0 + + + + \ (x+2)$
$- - - 0 + + + + \ (x+2)$
$+ + + \,{-2}\, - - - 0 + + +$
∞

14. $\lim\limits_{x \to 0^+} \dfrac{\cos x}{x} = \infty$

$+ + + 0 - - - - 0 + + + \cos x$
$- - - + + + + + + + + + \ x$
$0 \quad \frac{\pi}{2} \quad \frac{3\pi}{2}$
$- - - + + + - - - - + + +$
∞

15. $\lim\limits_{x \to 1^-} \dfrac{10^x}{\log x} = -\infty$

$+ + + + + + 10^x$
und $- - - - 0 + + + + \log x$
$0 \ - - - \ 1 + + + +$

$\log_{10} x = 0$
$10^0 = x$
$1 = x$

$\log 1$
$= \log_{10} 10^0$
$= 0$

3.3. continued

16 $\lim_{x \to 3^-} \frac{x+3}{x^2-4x+3} = -\infty$

$\lim_{x \to 3^-} \frac{x+3}{(x-3)(x-1)}$

- - - - 0 + + + + + + (x+3)
- - - - - - - - 0 + + (x-3)
- - - - 0 + + + (x-1)
- - - -3 + + 1 - - 3 + +

17. $\lim_{x \to 1} \frac{2x-1}{(x-1)^3}$

- - - - 0 + + + + (2x-1)
- - - - - - 0 + + (x-1)
- - - - - 0 + + (x-1)
- - - - - 0 + + (x-1)
+ + + $\frac{1}{2}$ - - 1 + + +

does not ~~exist~~

$1^- \leftarrow -\infty$

$1^+ \leftarrow +\infty$

18 $\lim_{x \to -5} \frac{x^3}{(x+5)^2}$

- - - - - 0 + + x
- - - - - 0 + + x
- - - - - 0 + + x
- - - 0 + + + + + x+5
- - - - 0 + + + + x+5
- - - -5 - - - 0 + + +

$= -\infty$

(same on both sides)

19. $\lim_{x \to 4} \frac{x-4}{x^2-4x}$

$\lim_{x \to 4} \frac{(x-4)}{x(x-4)}$

$\lim_{x \to 4} \frac{1}{x}$

$= \frac{1}{4}$

20. $\lim_{x \to 0} \frac{6x}{x^2+3x}$

$\lim_{x \to 0} \frac{6}{x+3}$

$= \frac{6}{0+3}$

$= 2$

$3w^2+4w-4$
$3w^2+6w-2w-4$
$3w(w+2)-2(w+2)$

$2w^2+7w+6$
$2w^2+4w+3w+6$
$2w(w+2)+3(w+2)$

21 $\lim_{x \to -5} \frac{x+5}{x^2-25}$

$\lim_{x \to -5} \frac{x+5}{(x+5)(x-5)}$

$\lim_{x \to -5} \frac{1}{x-5}$

$= \frac{1}{-5-5} = -\frac{1}{10}$

22. $\lim_{x \to 1} \frac{x^2+4x-5}{x^2+x-2}$

$\lim_{x \to 1} \frac{(x+5)\cancel{(x-1)}}{(x+2)\cancel{(x-1)}}$

$= \frac{1+5}{1+2}$

$= \frac{6}{3} = 2$

23. $\lim_{w \to -2} \frac{3w^2+4w-4}{2w^2+7w+6}$

$\lim_{w \to -2} \frac{(3w-2)(w+2)}{(2w+3)(w+2)}$

$= \frac{3(-2)-2}{2(-2)+3}$

$= \frac{-8}{-1} = 8$

24 $\lim_{s \to 2} \frac{s-2}{s^3-8}$

$\lim_{s \to 2} \frac{\cancel{s-2}}{\cancel{(s-2)}(s^2+2s+4)}$

$\frac{1}{(2)^2+2(2)+4}$

$= \frac{1}{12}$

25. $\lim_{x \to 5/3} \frac{27v^3-125}{3v-5}$

$\lim_{x \to \frac{5}{3}} \frac{\cancel{(3v-5)}(9v^2+15v+25)}{\cancel{(3v-5)}}$

$= 9\left(\frac{5}{3}\right)^2 + 15\left(\frac{5}{3}\right) + 25$

$= 25 + 25 + 25$

$= 75$

26. $\lim_{t \to -1} \frac{t^4-3t^2+2}{t+1}$

$\lim_{t \to -1} \frac{(t+1)(t-1)(t^2-2)}{(t+1)}$

$= (-1-1)((-1)^2-2)$

$= (-2)(-1)$

$= 2$

$(1+2h+h^2)(1+h)$
$1+2h+h^2+h+2h^2+h^3$

3.3 continued.

27. $\lim\limits_{x\to 1} \dfrac{x^7-1}{x-1}$

$\lim\limits_{x\to 1} \dfrac{(x-1)(x^6+x^5+x^4+x^3+x^2+x+1)}{x-1}$

$= (1)^6+(1)^5+(1)^4+(1)^3+(1)^2+1+1$

$= 7$

28. $\lim\limits_{x\to 0} \dfrac{(x+1)^2-1}{x}$

$\lim\limits_{x\to 0} \dfrac{(x+1-1)(x+1+1)}{x}$

$\lim\limits_{x\to 0} \dfrac{(x)(x+2)}{x}$

$0+2 = 2$

29. $\lim\limits_{h\to 0} \dfrac{(3+h)^2-2(3+h)-3}{h}$

$\lim\limits_{h\to 0} \dfrac{9+6h+h^2-6-2h-3}{h}$

$\lim\limits_{h\to 0} \dfrac{h^2+4h}{h}$

$\lim\limits_{h\to 0} h+4$

$= 0+4 = 4$

30. $\lim\limits_{h\to 0} \dfrac{(1+h)^3-2(1+h)+1}{h}$

$\lim\limits_{h\to 0} \dfrac{1+3h+3h^2+h^3-2-2h+1}{h}$

$\lim\limits_{h\to 0} \dfrac{h+3h^2+h^3}{h}$

$\lim\limits_{h\to 0} 1+3h+h^2$

$= 1+3(0)+0 = 1$

31. $\lim\limits_{x\to 4} \dfrac{\frac{1}{x-2}-\frac{1}{2}}{x-4}$

$\lim\limits_{x\to 4} \dfrac{2-x+2}{2(x-2)}\left(\dfrac{1}{x-4}\right)$

$\lim\limits_{x\to 4} \dfrac{\cancel{4-x}^{\,-1}}{2(x-2)\cancel{(x-4)}}$

$\dfrac{-1}{2(4-2)} = -\dfrac{1}{4}$

32. $\lim\limits_{x\to 1} \dfrac{\frac{1}{2x+1}-\frac{1}{3}}{x-1}$

$\lim\limits_{x\to 1} \dfrac{3-2x-1}{3(2x+1)}\left(\dfrac{1}{x-1}\right)$

$\lim\limits_{x\to 1} \dfrac{-2x+2}{3(2x+1)}\left(\dfrac{1}{x-1}\right)$

$\lim\limits_{x\to 1} \dfrac{-2\cancel{(x-1)}}{3(2x+1)}\cdot\left(\dfrac{1}{\cancel{x-1}}\right)$

$\dfrac{-2}{3(2(1)+1)} = \dfrac{-2}{9}$

33. $\lim\limits_{a\to 0} \dfrac{\frac{1}{(a+2)^2}-\frac{1}{4}}{a}$

$\lim\limits_{a\to 0} \dfrac{4-a^2-4a-4}{4(a+2)^2}\cdot\dfrac{1}{a}$

$\lim\limits_{a\to 0} \dfrac{-a(a+4)}{4(a+2)^2}\cdot\dfrac{1}{a}$

$= \dfrac{-(0+4)}{4(0+2)^2} = \dfrac{-4}{16} = -\dfrac{1}{4}$

34. $\lim\limits_{x\to 9} \dfrac{x-9}{\sqrt{x}-3}$

$\lim\limits_{x\to 9} \dfrac{(\sqrt{x}-3)(\sqrt{x}+3)}{(\sqrt{x}-3)}$

$= \sqrt{9}+3$

$= 3+3$

$= 6$

3.3 continued

35. $\lim_{y\to 0} \frac{\sqrt{y+2}-\sqrt{2}}{y} \cdot \frac{\sqrt{y+2}+\sqrt{2}}{\sqrt{y+2}+\sqrt{2}}$

$\lim_{y\to 0} \frac{y+2-2}{y(\sqrt{y+2}+\sqrt{2})}$

$\lim_{y\to 0} \frac{\cancel{y}}{\cancel{y}(\sqrt{y+2}+\sqrt{2})}$

$\frac{1}{\sqrt{0+2}+\sqrt{2}} = \frac{1}{2\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \frac{\sqrt{2}}{4}$

36. $\lim_{x\to 1} \frac{2-\sqrt{5-x}}{1-x} \cdot \frac{2+\sqrt{5-x}}{2+\sqrt{5-x}}$

$= \lim_{x\to 1} \frac{4-(5-x)}{(1-x)(2+\sqrt{5-x})} \leftarrow -1+x$

$= \lim_{x\to 1} \frac{-1\cancel{(1-x)}}{\cancel{(1-x)}(2+\sqrt{5-x})}$

$= \frac{-1}{2+\sqrt{5-1}} = \frac{-1}{4}$

37. $\lim_{x\to 5} \frac{x-5}{\sqrt{x+4}-3} \cdot \frac{\sqrt{x+4}+3}{\sqrt{x+4}+3}$

$\lim_{x\to 5} \frac{(x-5)(\sqrt{x+4}+3)}{(x+4)-9}$

$\lim_{x\to 5} \frac{\cancel{(x-5)}(\sqrt{x+4}+3)}{\cancel{(x-5)}}$

$= \sqrt{5+4}+3 = 6$

38. $\lim_{q\to 0} \frac{\frac{1}{\sqrt{4+q}}-\frac{1}{2}}{q}$

$= \lim_{q\to 0} \frac{2-\sqrt{4+q}}{2\sqrt{4+q}} \cdot \frac{1}{q} \cdot \frac{2+\sqrt{4+q}}{2+\sqrt{4+q}}$

$= \lim_{q\to 0} \frac{4-(4+q)}{2q\sqrt{4+q}(2+\sqrt{4+q})}$

$= \lim_{q\to 0} \frac{-\cancel{q}}{2\cancel{q}\sqrt{4+q}(2+\sqrt{4+q})}$

$= \frac{-1}{2\sqrt{4+0}(2+\sqrt{4+0})} = \frac{-1}{16}$

39. $\lim_{x\to 4} \frac{8\sqrt{x}-x^2}{2-\sqrt{x}} \left(\frac{8\sqrt{x}+x^2}{8\sqrt{x}+x^2}\right)\left(\frac{2+\sqrt{x}}{2+\sqrt{x}}\right)$

$\lim_{x\to 4} \frac{(64x-x^4)(2+\sqrt{x})}{(4-x)(8\sqrt{x}+x^2)}$

$\lim_{x\to 4} \frac{x\cancel{(4-x)}(16+4x+x^2)(2+\sqrt{x})}{\cancel{(4-x)}(8\sqrt{x}+x^2)}$

$= \frac{(4)(16+4(4)+4^2)(2+\sqrt{4})}{8\sqrt{4}+4^2}$

$= \frac{(4)(48)(4)}{32} = 24$

40. $\lim_{x\to\infty} \frac{6}{3x-2} =$

$\lim_{x\to\infty} \frac{\frac{6}{x}}{\frac{3x}{x}-\frac{2}{x}}$

$\lim_{x\to\infty} \frac{\frac{6}{x}}{3-\frac{2}{x}}$

$\frac{0}{3-0} = 0$

41. $\lim_{x\to\infty} \frac{2x+5}{x+1}$

$\lim_{x\to\infty} \frac{\frac{2x}{x}+\frac{5}{x}}{\frac{x}{x}+\frac{1}{x}}$

$= \lim_{x\to\infty} \frac{2+\frac{5}{x}}{1+\frac{1}{x}} = \frac{2+0}{1+0} = 2$

42. $\lim_{x\to\infty} \frac{6x^2-1}{2x^2+3x}$

$\lim_{x\to\infty} \frac{\frac{6x^2}{x^2}-\frac{1}{x^2}}{\frac{2x^2}{x^2}-\frac{3x}{x^2}}$

$= \lim_{x\to\infty} \frac{6-\frac{1}{x^2}}{2-\frac{3}{x}}$

$= \frac{6-0}{2-0}$

$= 3$

3.3 - continued

43. $\lim_{x \to -\infty} \dfrac{-4x^3}{x^3 - 2x^2}$

$\lim_{x \to -\infty} \dfrac{\frac{-4x^3}{x^3}}{\frac{x^3}{x^3} - \frac{2x^2}{x^3}}$

$\lim_{x \to -\infty} \dfrac{-4}{1 - \frac{2}{x}}$

$= \dfrac{-4}{1-0} = -4$

44. $\lim_{x \to -\infty} \dfrac{(x+2)(2x-1)}{x^2+4x+1}$

$\lim_{x \to -\infty} \dfrac{2x^2+3x-2}{x^2+4x+1}$

$\lim_{x \to -\infty} \dfrac{\frac{2x^2}{x^2} + \frac{3x}{x^2} - \frac{2}{x^2}}{\frac{x^2}{x^2} + \frac{4x}{x^2} + \frac{1}{x^2}}$

$\lim_{x \to -\infty} \dfrac{2 + \frac{3}{x} - \frac{2}{x^2}}{1 + \frac{4}{x} + \frac{1}{x^2}}$

$\dfrac{2+0-0}{1+0+0} = 2$

45. $\lim_{x \to \infty} \dfrac{2x^2}{x-1}$

$\lim_{x \to \infty} \dfrac{\frac{2x^2}{x}}{\frac{x}{x^2} - \frac{1}{x}}$

$\lim_{x \to \infty} \dfrac{2x}{1 - \frac{1}{x}}$

$= \dfrac{2x}{1-0} = \infty$

46 $\lim_{x \to -\infty} \dfrac{2x^2}{x-1}$

$\lim_{x \to -\infty} \dfrac{\frac{2x^2}{x^2}}{\frac{x}{x^2} - \frac{1}{x}}$

$\lim_{x \to -\infty} \dfrac{2x}{1 - \frac{1}{x}}$

$= \dfrac{2x}{1-0} \quad -\infty$

47. $\lim_{x \to -\infty} \dfrac{\sqrt{4x^2 - x}}{x-2}$

$\lim_{x \to -\infty} \dfrac{\sqrt{x^2\left(4 - \frac{1}{x}\right)}}{x\left(1 - \frac{2}{x}\right)}$

$\lim_{x \to -\infty} \dfrac{|x|\sqrt{4 - \frac{1}{x}}}{x\left(1 - \frac{2}{x}\right)}$

Because it approaches $-\infty$

$\lim_{x \to -\infty} \dfrac{-x\sqrt{4 - \frac{1}{x}}}{x\left(1 - \frac{2}{x}\right)}$

$\dfrac{-\sqrt{4-0}}{1-0}$

$= -2$

48. $\lim_{g \to \infty} \dfrac{2g+5}{\sqrt{g^2+6g}}$

$\lim_{g \to \infty} \dfrac{g\left(2 + \frac{5}{g}\right)}{\sqrt{g^2\left(1 + \frac{6}{g}\right)}}$

$\lim_{g \to \infty} \dfrac{g\left(2 + \frac{5}{g}\right)}{|g|\sqrt{1 + \frac{6}{g}}}$

$\lim_{g \to \infty} \dfrac{g\left(2 + \frac{5}{g}\right)}{g\sqrt{1 + \frac{6}{g}}}$

Because it approaches $+\infty$

$\dfrac{2+0}{\sqrt{1+0}} = 2$

$\sqrt{x^2} = |x|$

Hilroy

3.3 continued

49. $\lim_{x \to -\infty} \frac{\sqrt{x^2-4x+4}}{5-x}$

$\lim_{x \to -\infty} \frac{\sqrt{x^2\left(1-\frac{4}{x}+\frac{4}{x^2}\right)}}{x\left(\frac{5}{x}-1\right)}$

$\lim_{x \to -\infty} \frac{|x|\sqrt{1-\frac{4}{x}+\frac{4}{x^2}}}{x\left(\frac{5}{x}-1\right)}$

$\lim_{x \to -\infty} \frac{-x\sqrt{1-\frac{4}{x}+\frac{4}{x^2}}}{x\left(\frac{5}{x}-1\right)}$

$\frac{-1\sqrt{1-0+0}}{0-1}$

$= 1$

50. $\lim_{x \to \infty} \frac{\sqrt{x^2-2x}}{x^2}$

$\lim_{x \to \infty} \frac{\sqrt{x^2\left(1-\frac{2}{x}\right)}}{x^2}$

$\lim_{x \to \infty} \frac{|x|\sqrt{1-\frac{2}{x}}}{x^2}$

$\lim_{x \to \infty} \frac{x\sqrt{1-\frac{2}{x}}}{x^2} = \sqrt{1-\frac{2}{x}} \cdot \frac{1}{x}$

$\sqrt{1-0} \cdot 0 = 0$

$= 0$

51. $\lim_{x \to \infty} \frac{\sqrt{x^2+4x}-x}{1} \cdot \frac{\sqrt{x^2+4x}+x}{\sqrt{x^2+4x}+x}$

$= \lim_{x \to \infty} \frac{x^2+4x-x^2}{\sqrt{x^2+4x}+x}$

$= \lim_{x \to \infty} \frac{4x}{\sqrt{x^2\left(1+\frac{4}{x}\right)}+x} = \lim_{x \to \infty} \frac{4x}{x\sqrt{1+\frac{4}{x}}+x}$

$= \lim_{x \to \infty} \frac{4}{\sqrt{1+\frac{4}{x}}+1}$

$= \frac{4}{\sqrt{1+0}+1} = 2$

52. $\lim_{x \to 0^+} \frac{|x|}{x}$

$= \lim_{x \to 0^+} \frac{(x)}{x}$

$= \lim_{x \to 0^+} 1$

$= 1$

53. $\lim_{x \to 0^-} \frac{|x|}{x}$

$\lim_{x \to 0^-} \frac{-(x)}{x}$

$\lim_{x \to 0^-} -1$

$= -1$

54. $\lim_{x \to 0} \frac{|x|}{x}$

= does not exist.

3.3 continued

55. $\lim_{x\to 2^+} \frac{|x-2|}{4-x^2}$

$\lim_{x\to 2^+} \frac{\cancel{(x-2)}^{-1}}{\cancel{(2-x)}(2+x)}$

$\frac{-1}{2+2} = \frac{-1}{4}$

56. $\lim_{x\to -1^-} \frac{|x^2-x-2|}{x+1}$

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

$= \lim_{x\to -1} -|x-2|$

$= -|-1-2| = -|-3| = -(3) = -3$

57. $\lim_{x\to 1^-} \frac{|x^5-1|}{x-1}$

$\lim_{x\to 1^-} \frac{-(x-1)(x^4+x^3+x^2+x+1)}{(x-1)}$

$\lim_{x\to 1^-} -(x^4+x^3+x^2+x+1)$

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

58. $\lim_{x\to 3^-} \frac{x^3-27}{|x-3|}$

$= \lim_{x\to 3^-} \frac{(x-3)(x^2+3x+9)}{-(x-3)}$

$= \lim_{x\to 3^-} -1(x^2+3x+9)$

$= -1(9+9+9) = -27$

59. $\lim_{x\to 3^+} \frac{x^3-27}{|x-3|}$

$= \lim_{x\to 3^+} \frac{(x-3)(x^2+3x+9)}{(x-3)}$

$= \lim_{x\to 3^+} x^2+3x+9$

$9+9+9 = 27$

60. $\lim_{x\to 3} \frac{x^3-27}{|x-3|}$

= does not exist

61. $F(x) = \begin{cases} (x+1)2^{x-1}, & \text{if } x \geq 0 \\ 2^{1-x}, & \text{if } x < 0 \end{cases}$

a) $\lim_{x\to 3} F(x) =$

$= (3+1)2^{3-1}$

$= 4(4)$

$= 16$

b) $\lim_{x\to -3} f(x)$

$= 2^{1-(-3)}$

$= 2^4$

$= 16$

c) $\lim_{x\to 0^+} f(x)$

$= (0+1)2^{0-1}$

$= 1(2^{-1})$

$= \frac{1}{2}$

d) $\lim_{x\to 0^-} f(x)$

$= 2^{1-0}$

$= 2^1$

$= 2$

e) $\lim_{x\to 0} f(x)$

does not exist

3.3 continued

62. $g(x) = \begin{cases} \dfrac{x^2-4}{x+2}, & \text{if } x \neq -2 \\ -5, & \text{if } x = -2 \end{cases}$

a) $\lim\limits_{x \to 3} g(x)$

$= \dfrac{3^2-4}{3+2} = \dfrac{5}{5} = 1$

b) $\lim\limits_{x \to -2} f(x)$

$= -5$ ← different than book
([illegible])

$\dfrac{x^2-4}{x+2} = \dfrac{(x-2)\cancel{(x+2)}}{\cancel{(x+2)}}$

$= -2-2 = -4$

63. $h(x) = \begin{cases} 2, & \text{if } x < 0 \\ x+2, & \text{if } 0 \leq x \leq 4 \\ x^2-11, & \text{if } x > 4 \end{cases}$

a) $\lim\limits_{x \to -6} h(x)$

$= 2$

b) $\lim\limits_{x \to 0^-} h(x)$

$= 2$

c) $\lim\limits_{x \to 0^+} h(x)$

$= 0+2 = 2$

d) $\lim\limits_{x \to 0} h(x)$

$= 2$

e) $\lim\limits_{x \to 3} h(x)$

$= 3+2 = 5$

f) $\lim\limits_{x \to 4^-} h(x)$

$= 4+2 = 6$

g) $\lim\limits_{x \to 4^+} h(x)$

$= (4)^2-11 = 5$

h) $\lim\limits_{x \to 4} h(x)$

= does not exist

i) $\lim\limits_{x \to 5} h(x)$

$(5)^2-11 = 14$