

# Homework § 2.2

36.  $f(x) = \frac{\sin(3x)}{x}$  ;  $\lim_{x \rightarrow 0} \frac{\sin(3x)}{x} = 3$

x	-0.1	-0.01	-0.001	-0.0001	0	0.0001	0.001	0.01	0.1
$\frac{\sin(3x)}{x}$	2.95520267	2.99955002	2.99999550	2.99999996	DNE	2.99999996	2.999995502	2.9995500	2.95520267

39.  $\lim_{x \rightarrow 1} (1-2x) = -1$

x	0.9	0.99	0.999	0.9999	1	1.0001	1.001	1.01	1.1
$1-2x$	-0.80000	-0.980000	-0.998000	-0.99980000	-1	-1.00020000	-1.002000	-1.02000	-1.2000

46. true

47. false.  $\lim_{x \rightarrow -3^+} f(x) = +\infty$ .

48. false.  $\lim_{x \rightarrow -8} f(x) = -6 \neq -3 = f(-8)$

49. false.  $\lim_{x \rightarrow 6^+} f(x) = 5 \neq 2 = \lim_{x \rightarrow 6^-} f(x)$ . So  $\lim_{x \rightarrow 6} f(x) = \text{DNE}$ .

59.  $\lim_{x \rightarrow -2^-} f(x) = 0$

60. 2

61. DNE

62. -2

63. 2

64. DNE

68. 0

69. 0

70. 0

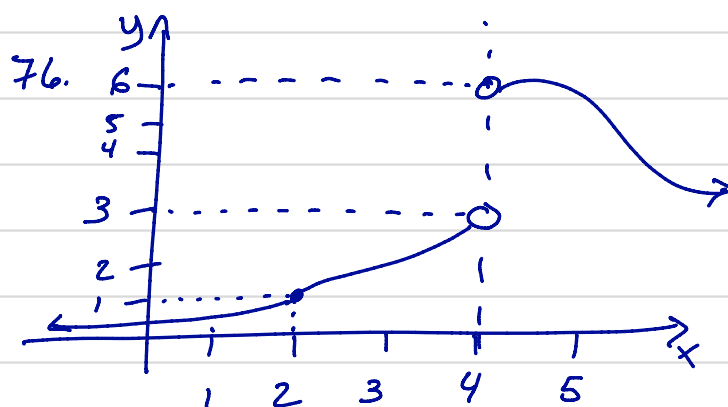
71. -2

72. 0

73. DNE

74. -1

75. 0



Problem A:

$x$	3.9	3.99	3.999	3.9999	4	4.0001	4.001	4.01	4.1
$\frac{\ln(x) - \ln(4)}{x - 4}$	0.253178	0.2525188	0.250250..	0.25002500	DNE	0.249975	0.249750	0.2475186	0.226757

$$\lim_{x \rightarrow 4} \frac{\ln(x) - \ln(4)}{x - 4} = \frac{1}{4}$$

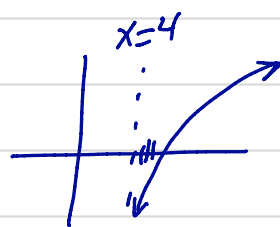
Problem B:

$$\textcircled{1} \lim_{x \rightarrow -3^-} \frac{4x}{x+3} = +\infty$$

Justification: as  $x \rightarrow -3^-$  (#'s like -3.1 or -3.01),  $x+3 \rightarrow 0^-$  and  $4x \rightarrow -12$   
OR a table of values

$$\textcircled{2} \lim_{x \rightarrow 4^+} \ln(x^2 - 16) = -\infty.$$

Justification: As  $x \rightarrow 4^+$ ,  $x^2 - 16 \rightarrow 0^+$ . The graph:



Problem C:  $f(x) = \frac{x+2}{x(x-3)}$ .  $x=0$  and  $x=3$  make  $f(x)$  undefined.

Answer: VA:  $x=0$  and  $x=3$

$$\text{Justification: } \lim_{x \rightarrow 0^+} \frac{x+2}{x(x-3)} = -\infty; \quad \lim_{x \rightarrow 3^+} \frac{x+2}{x(x-3)} = +\infty$$

So  $x=0$  is a VA

So  $x=3$  is a V.A.