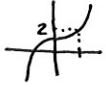
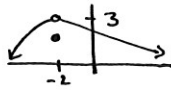


hw solutions section 2.4 Limits

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



5. $\lim_{x \rightarrow -2} f(x) = 3$



8. $\lim_{x \rightarrow 0} f(x) = \text{DNE}$



12. $f(x) = \frac{|x-1|}{x-1}$, $\lim_{x \rightarrow 1} f(x) = \text{DNE}$

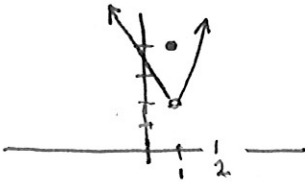
x	.9	.99	.999	1.001	1.01	1.1
f(x)	-1	-1	-1	1	1	1

13. $f(x) = \frac{1}{(x-1)^2}$, $\lim_{x \rightarrow 1} f(x) = \infty$

x	.9	.99	.999	1.001	1.01	1.1
f(x)	100	10000	1000000	1000000	10000	100

20. Sketch a graph & find $\lim_{x \rightarrow 1} f(x)$

$$f(x) = \begin{cases} -2x+4 & , x < 1 \\ 4 & , x = 1 \\ x^2+1 & , x > 1 \end{cases}$$



$\lim_{x \rightarrow 1} f(x) = 2$

24. $\lim_{x \rightarrow -2} -3 = -3$

27. $\lim_{x \rightarrow 1} (1-2x^2) = \lim_{x \rightarrow 1} 1 - 2 \left[\lim_{x \rightarrow 1} x \right]^2 = 1 - 2(1)^2 = -1$

35. $\lim_{x \rightarrow 2} \sqrt{x+2} = \sqrt{\lim_{x \rightarrow 2} x + 2} = \sqrt{2+2} = 2$

43. $\lim_{x \rightarrow a} [2f(x) - 3g(x)] = 2 \lim_{x \rightarrow a} f(x) - 3 \lim_{x \rightarrow a} g(x) = 2(3) - 3(4) = -6$

46. $\lim_{x \rightarrow a} \sqrt[3]{5f(x) + 3g(x)}$

$$= \sqrt[3]{5 \lim_{x \rightarrow a} f(x) + 3 \lim_{x \rightarrow a} g(x)}$$

$$= \sqrt[3]{5(3) + 3(4)} = \sqrt[3]{27} = 3$$

52. $\lim_{x \rightarrow 0} \frac{2x^2 - 3x}{x} = \lim_{x \rightarrow 0} (2x - 3) = 2 \cdot 0 - 3 = -3$

59. $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1}$

way 1: $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{(\sqrt{x} - 1)(\sqrt{x} + 1)} = \lim_{x \rightarrow 1} \frac{1}{\sqrt{x} + 1} = \frac{1}{2}$

way 2: $\lim_{x \rightarrow 1} \frac{\sqrt{x} - 1}{x - 1} \cdot \frac{\sqrt{x} + 1}{\sqrt{x} + 1} = \lim_{x \rightarrow 1} \frac{x - 1}{(x - 1)(\sqrt{x} + 1)} = \lim_{x \rightarrow 1} \frac{1}{\sqrt{x} + 1} = \frac{1}{2}$

64. $\lim_{x \rightarrow \infty} (x^3 - x) = \infty$

$\lim_{x \rightarrow -\infty} (x^3 - x) = -\infty$

66. $\lim_{x \rightarrow \infty} \left(\frac{x^2}{x^2 + 1} \right) = 1$

$\lim_{x \rightarrow -\infty} \frac{x^2}{x^2 + 1} = 1$

74. $\lim_{x \rightarrow -\infty} \frac{4x^2 + 1}{x + 2} = -\infty$

75. $\lim_{x \rightarrow -\infty} \frac{3x^3 + x^2 + 1}{x^3 + 1} = 3$

80. $\lim_{x \rightarrow \infty} \frac{(2x^2 - 1)}{x^3 + x^2 + 1} = 0$

70. $f(x) = \frac{2x}{x+1}$, $\lim_{x \rightarrow \infty} f(x) = 2$, $\lim_{x \rightarrow -\infty} f(x) = 2$

x	1	10	100	1000
f(x)	1	1.81	1.9801	1.998

x	-5	-10	-100	-1000
f(x)	2.5	2.2	2.02	2.002

85. $T(x) = \frac{120x^2}{x^2 + 4}$

(a) $T(1) = 24$, $T(2) = 60$, $T(3) = 83.0769$

(b) $\lim_{x \rightarrow \infty} T(x) = \lim_{x \rightarrow \infty} \frac{120x^2}{x^2 + 4} \cdot \frac{1/x^2}{1/x^2}$

$$= \lim_{x \rightarrow \infty} \frac{120}{1 + 4/x^2} = \frac{120}{1 + 0} = 120$$

in the long run: \$120 million