Assignment 3 (SOLUTION from Textbook Manual Solution)

Text: *Calculus for the Life Sciences, S. Schreiber, K. Smith and W. Getz, Wiley, 2014*

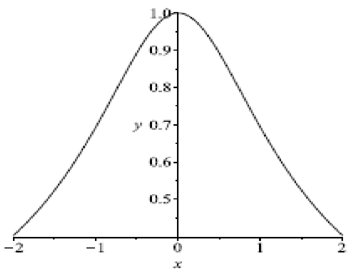
Section 2.2

20. $\lim_{x \to 1} \dfrac{\ln x}{x-1} = 1$; as x gets closer to 1, the value of the function gets closer to 1.

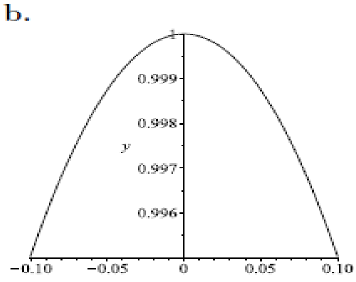
24. $\lim_{x \to 4} \dfrac{(x-4)^2}{|x-4|} = 0$; as x gets closer to 4, the value of the function gets closer to 0.

26. Yes, $\lim_{x \to 0} |x| \sin(1/x) = 0$. As x gets closer to 0, the value of the function gets closer to 0.

32. a.

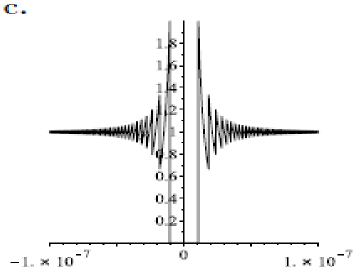


b.



$\lim_{x \to 0} f(x) = 1$

c.



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

d. When x becomes small, in the numerator x^2 becomes zero, and thus the numerator becomes 0. Thus the value of f becomes 0 instead of the actual value.

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42. The limit exists at $x = 150$ when $6.25 \cdot 150 = 150a + b$, and the limit exists at $x = 300$ when $300a + b = 1300$. This system of equations can be solved for a and b (multiply the first equation by 2, then subtract the second equation for example), and we obtain that $a = 29/12$ and $b = 575$.

Section 2.3

8. We obtain that $\lim_{x\to 0}((x+1)^2 - 1)/x = \lim_{x\to 0}(x^2 + 2x)/x = \lim_{x\to 0}(x+2) = 2$, because the last expression is a polynomial.

10. We obtain that $\lim_{t\to 0}\frac{\sqrt{4-t^2}-2}{t^2} =$

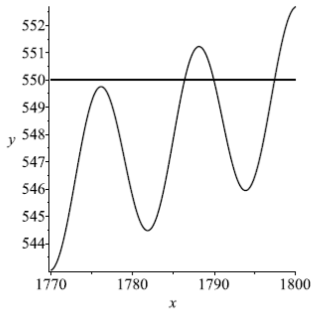
$$= \lim_{t\to 0}\frac{\sqrt{4-t^2}-2}{t^2}\cdot\frac{\sqrt{4-t^2}+2}{\sqrt{4-t^2}+2} = \lim_{t\to 0}\frac{(4-t^2)-4}{t^2(\sqrt{4-t^2}+2)} = \lim_{t\to 0}\frac{-1}{\sqrt{4-t^2}+2} =$$

$-1/4$, because of the composition limit law and continuity of elementary functions.

18. f is not continuous at $a = 0$ because the value of the function is not equal to the limit at that point. Redefining f to be 0 at this point makes the function continuous.

26. Let $f(x) = \sqrt[3]{x-8} + 9x^{2/3} - 29$. This is a continuous function on $\mathbb{R}$; $f(0) = -31$ and $f(8) = 7$, so there is a c between 0 and 8 such that $f(c) = 0$, which gives a solution of the equation.

44.



According to the graph, we can start with $a = 1785$, $b = 1788$. The result is 1786.38.