FDW K BOOK2.1

Quick Review 2.1   *(For help, go to Section 1.2.)*

Exercise numbers with a gray background indicate problems that the authors have designed to be solved *without a calculator*.

In Exercises 1–4, find $f(2)$.

1. $f(x) = 2x^3 - 5x^2 + 4$

2. $f(x) = \dfrac{4x^2 - 5}{x^3 + 4}$

3. $f(x) = \sin\left(\pi\,\dfrac{x}{2}\right)$

4. $f(x) = \begin{cases} 3x - 1, & x < 2 \\ \dfrac{1}{x^2 - 1}, & x \geq 2 \end{cases}$

In Exercises 5–8, write the inequality in the form $a < x < b$.

5. $|x| < 4$

6. $|x| < c^2$

7. $|x - 2| < 3$

8. $|x - c| < d^2$

In Exercises 9 and 10, write the fraction in reduced form.

9. $\dfrac{x^2 - 3x - 18}{x + 3}$

10. $\dfrac{2x^2 - x}{2x^2 + x - 1}$

Section 2.1 Exercises

In Exercises 1–4, an object dropped from rest from the top of a tall building falls $y = 16t^2$ feet in the first t seconds.

1. Find the average speed during the first 3 seconds of fall.

2. Find the average speed during the first 4 seconds of fall.

3. Find the speed of the object at $t = 3$ seconds and confirm your answer algebraically.

4. Find the speed of the object at $t = 4$ seconds and confirm your answer algebraically.

In Exercises 5 and 6, use $\lim_{x \to c} k = k$, $\lim_{x \to c} x = c$, and the properties of limits to find the limit.

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

6. $\lim\limits_{x \to c} \dfrac{x^4 - x^3 + 1}{x^2 + 9}$

In Exercises 7–14, determine the limit by substitution. Support graphically.

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

8. $\lim\limits_{x \to -4} (x + 3)^{1998}$

9. $\lim\limits_{x \to 1} (x^3 + 3x^2 - 2x - 17)$

10. $\lim\limits_{y \to 2} \dfrac{y^2 + 5y + 6}{y + 2}$

11. $\lim\limits_{y \to -3} \dfrac{y^2 + 4y + 3}{y^2 - 3}$

12. $\lim\limits_{x \to 1/2} \text{int } x$

13. $\lim\limits_{x \to -2} (x - 6)^{2/3}$

14. $\lim\limits_{x \to 2} \sqrt{x + 3}$

In Exercises 15–20, complete the following tables and state what you believe $\lim_{x \to 0} f(x)$ to be.

(a)

x	-0.1	-0.01	-0.001	-0.0001	...
$f(x)$	?	?	?	?	

(b)

x	0.1	0.01	0.001	0.0001	...
$f(x)$	?	?	?	?	

15. $f(x) = \dfrac{x^2 + 6x + 2}{x + 1}$

16. $f(x) = \dfrac{x^2 - x}{x}$

17. $f(x) = x \sin \dfrac{1}{x}$

18. $f(x) = \sin \dfrac{1}{x}$

19. $f(x) = \dfrac{10^x - 1}{x}$

20. $f(x) = x \sin(\ln|x|)$

In Exercises 21–24, explain why you cannot use substitution to determine the limit. Find the limit if it exists.

21. $\lim\limits_{x \to -2} \sqrt{x - 2}$

22. $\lim\limits_{x \to 0} \dfrac{1}{x^2}$

23. $\lim\limits_{x \to 0} \dfrac{|x|}{x}$

24. $\lim\limits_{x \to 0} \dfrac{(4 + x)^2 - 16}{x}$

In Exercises 25–34, determine the limit graphically. Confirm algebraically.

25. $\lim\limits_{x \to 1} \dfrac{x - 1}{x^2 - 1}$

26. $\lim\limits_{t \to 2} \dfrac{t^2 - 3t + 2}{t^2 - 4}$

27. $\lim\limits_{x \to 0} \dfrac{5x^3 + 8x^2}{3x^4 - 16x^2}$

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

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

30. $\lim\limits_{x \to 0} \dfrac{\sin 2x}{x}$

31. $\lim\limits_{x \to 0} \dfrac{\sin x}{2x^2 - x}$

32. $\lim\limits_{x \to 0} \dfrac{x + \sin x}{x}$

33. $\lim\limits_{x \to 0} \dfrac{\sin^2 x}{x}$

34. $\lim\limits_{x \to 5} \dfrac{x^3 - 125}{x - 5}$

In Exercises 35 and 36, use a graph to show that the limit does not exist.

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

36. $\lim\limits_{x \to 2} \dfrac{x + 1}{x^2 - 4}$

In Exercises 37–42, determine the limit.

37. $\lim\limits_{x \to 0^+} \text{int } x$

38. $\lim\limits_{x \to 0^-} \text{int } x$

39. $\lim\limits_{x \to 0.01} \text{int } x$

40. $\lim\limits_{x \to 2^-} \text{int } x$

41. $\lim\limits_{x \to 0^+} \dfrac{x}{|x|}$

42. $\lim\limits_{x \to 0^-} \dfrac{x}{|x|}$

In Exercises 43 and 44, which of the statements are true about the function $y = f(x)$ graphed there, and which are false?

43.
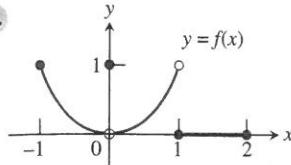
(a) $\lim\limits_{x \to -1^+} f(x) = 1$ (b) $\lim\limits_{x \to 0^-} f(x) = 0$

(c) $\lim\limits_{x \to 0^-} f(x) = 1$ (d) $\lim\limits_{x \to 0^-} f(x) = \lim\limits_{x \to 0^+} f(x)$

(e) $\lim\limits_{x \to 0} f(x)$ exists (f) $\lim\limits_{x \to 0} f(x) = 0$

(g) $\lim\limits_{x \to 0} f(x) = 1$ (h) $\lim\limits_{x \to 1} f(x) = 1$

(i) $\lim\limits_{x \to 1} f(x) = 0$ (j) $\lim\limits_{x \to 2^-} f(x) = 2$

44.
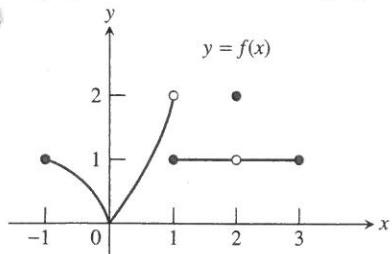
(a) $\lim\limits_{x \to -1^+} f(x) = 1$ (b) $\lim\limits_{x \to 2} f(x)$ does not exist.

(c) $\lim\limits_{x \to 2} f(x) = 2$ (d) $\lim\limits_{x \to 1^-} f(x) = 2$

(e) $\lim\limits_{x \to 1^+} f(x) = 1$ (f) $\lim\limits_{x \to 1} f(x)$ does not exist.

(g) $\lim\limits_{x \to 0^+} f(x) = \lim\limits_{x \to 0^-} f(x)$

(h) $\lim\limits_{x \to c} f(x)$ exists at every c in $(-1, 1)$.

(i) $\lim\limits_{x \to c} f(x)$ exists at every c in $(1, 3)$.

In Exercises 45–50, use the graph to estimate the limits and value of the function, or explain why the limits do not exist.

45.
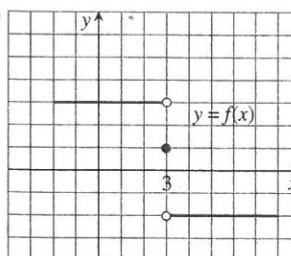
(a) $\lim\limits_{x \to 3^-} f(x)$

(b) $\lim\limits_{x \to 3^+} f(x)$

(c) $\lim\limits_{x \to 3} f(x)$

(d) $f(3)$

46.
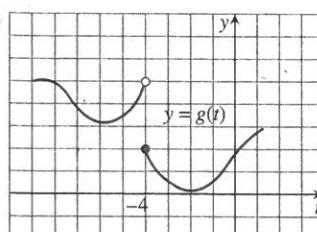
(a) $\lim\limits_{t \to -4^-} g(t)$

(b) $\lim\limits_{t \to -4^+} g(t)$

(c) $\lim\limits_{t \to -4} g(t)$

(d) $g(-4)$

47.
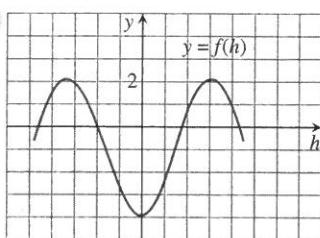
(a) $\lim\limits_{h \to 0^-} f(h)$

(b) $\lim\limits_{h \to 0^+} f(h)$

(c) $\lim\limits_{h \to 0} f(h)$

(d) $f(0)$

48.
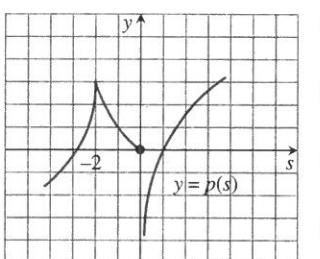
(a) $\lim\limits_{s \to -2^-} p(s)$

(b) $\lim\limits_{s \to -2^+} p(s)$

(c) $\lim\limits_{s \to -2} p(s)$

(d) $p(-2)$

49.
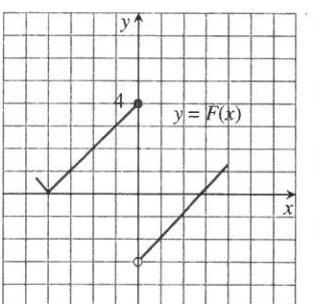
(a) $\lim\limits_{x \to 0^-} F(x)$

(b) $\lim\limits_{x \to 0^+} F(x)$

(c) $\lim\limits_{x \to 0} F(x)$

(d) $F(0)$

50.
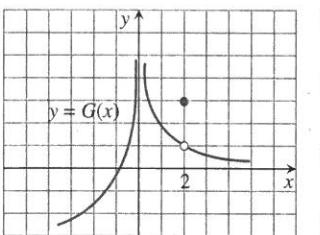
(a) $\lim\limits_{x \to 2^-} G(x)$

(b) $\lim\limits_{x \to 2^+} G(x)$

(c) $\lim\limits_{x \to 2} G(x)$

(d) $G(2)$

In Exercises 51–54, match the function with the table.

51. $y_1 = \dfrac{x^2 + x - 2}{x - 1}$

52. $y_1 = \dfrac{x^2 - x - 2}{x - 1}$

53. $y_1 = \dfrac{x^2 - 2x + 1}{x - 1}$

54. $y_1 = \dfrac{x^2 + x - 2}{x + 1}$

X	Y₁	
.7	-.4765	
.8	-.3111	
.9	-.1526	
1	0	
1.1	.14762	
1.2	.29091	
1.3	.43043	
X = .7		

(a)

X	Y₁	
.7	7.3667	
.8	10.8	
.9	20.9	
1	ERROR	
1.1	-18.9	
1.2	-8.8	
1.3	-5.367	
X = .7		

(b)

X	Y₁	
.7	2.7	
.8	2.8	
.9	2.9	
1	ERROR	
1.1	3.1	
1.2	3.2	
1.3	3.3	
X = .7		

(c)

X	Y₁	
.7	-.3	
.8	-.2	
.9	-.1	
1	ERROR	
1.1	.1	
1.2	.2	
1.3	.3	
X = .7		

(d)