Lecture 1

Solve the following questions

23–26 Evaluate the difference quotient for the given function. Simplify your answer.

23. $f(x) = 4 + 3x - x^2, \qquad \dfrac{f(3+h) - f(3)}{h}$

24. $f(x) = x^3, \qquad \dfrac{f(a+h) - f(a)}{h}$

25. $f(x) = \dfrac{1}{x}, \qquad \dfrac{f(x) - f(a)}{x - a}$

26. $f(x) = \dfrac{x+3}{x+1}, \qquad \dfrac{f(x) - f(1)}{x - 1}$

27–31 Find the domain of the function.

27. $f(x) = \dfrac{x}{3x - 1}$

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

29. $f(t) = \sqrt{t} + \sqrt[3]{t}$

30. $g(u) = \sqrt{u} + \sqrt{4 - u}$

31. $h(x) = \dfrac{1}{\sqrt[4]{x^2 - 5x}}$

32. Find the domain and range and sketch the graph of the function $h(x) = \sqrt{4 - x^2}$.

33–44 Find the domain and sketch the graph of the function.

33. $f(x) = 5$

34. $F(x) = \frac{1}{2}(x + 3)$

35. $f(t) = t^2 - 6t$

36. $H(t) = \dfrac{4 - t^2}{2 - t}$

37. $g(x) = \sqrt{x - 5}$

38. $F(x) = |2x + 1|$

39. $G(x) = \dfrac{3x + |x|}{x}$

40. $g(x) = \dfrac{|x|}{x^2}$

41. $f(x) = \begin{cases} x + 2 & \text{if } x < 0 \\ 1 - x & \text{if } x \geqslant 0 \end{cases}$

42. $f(x) = \begin{cases} 3 - \frac{1}{2}x & \text{if } x \leqslant 2 \\ 2x - 5 & \text{if } x > 2 \end{cases}$

43. $f(x) = \begin{cases} x + 2 & \text{if } x \leqslant -1 \\ x^2 & \text{if } x > -1 \end{cases}$

44. $f(x) = \begin{cases} x + 9 & \text{if } x < -3 \\ -2x & \text{if } |x| \leqslant 3 \\ -6 & \text{if } x > 3 \end{cases}$

65–70 Determine whether f is even, odd, or neither. If you have a graphing calculator, use it to check your answer visually.

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

66. $f(x) = \dfrac{x^2}{x^4 + 1}$

67. $f(x) = \dfrac{x}{x + 1}$

68. $f(x) = x\,|x|$

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

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