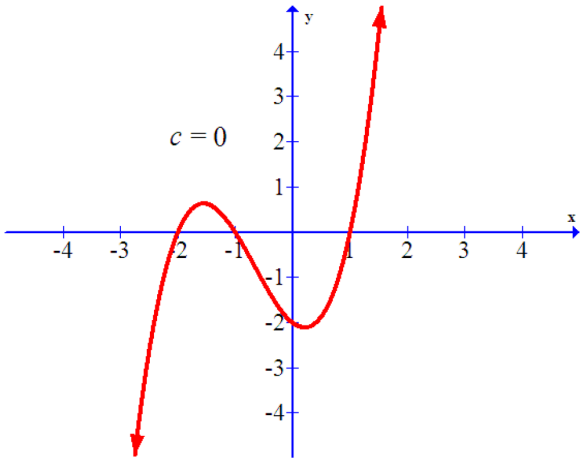
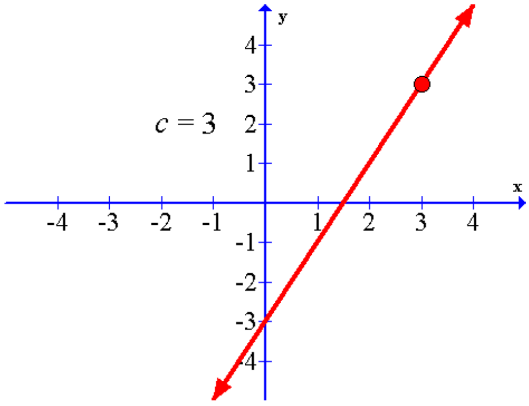
Exercise Set 2.1: Limits

For each graph given, find $\lim_{x \to c} f(x)$ for the stated value for c, or state that the limit does not exist.

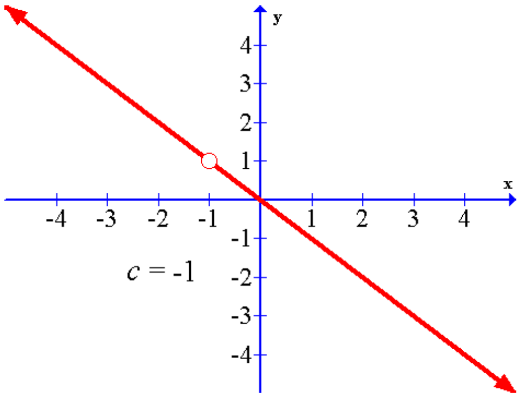
1.



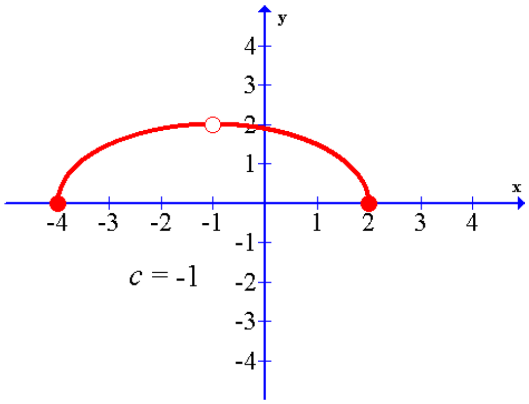
2.



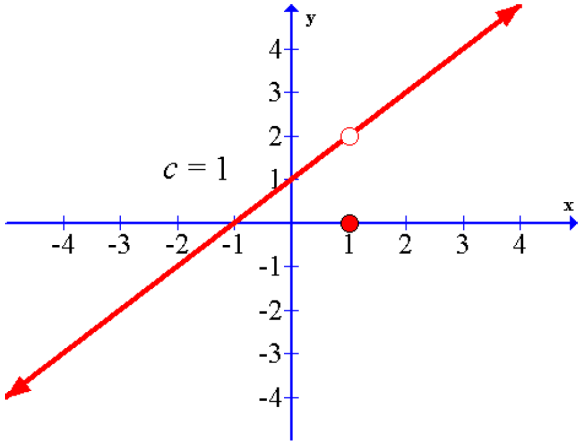
3.



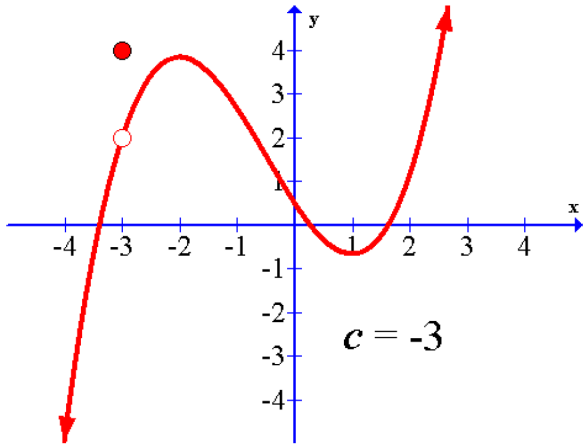
4.



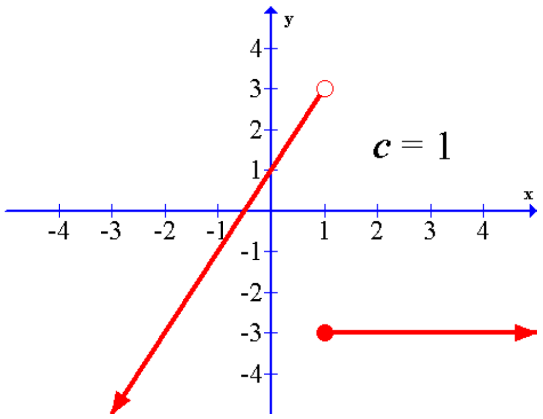
5.



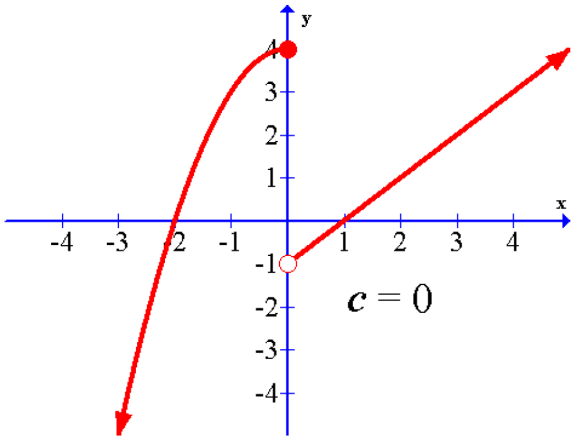
6.



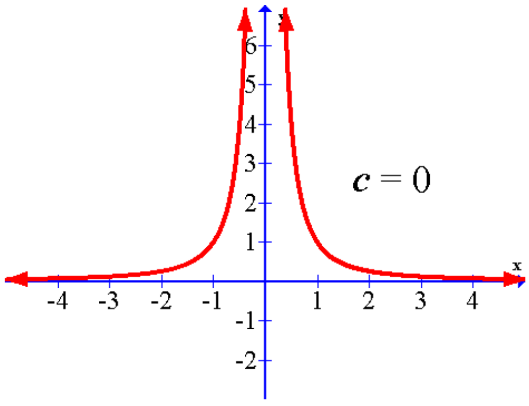
7.



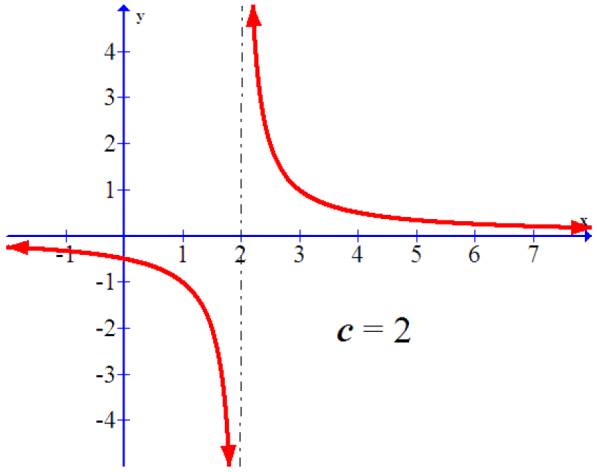
8.



9.



10.



For problems 11 – 44, find the indicated limit or state that the limit does not exist.

11. $\lim_{x\to 5}(3)$

12. $\lim_{x\to -1}\left(\sqrt{7}\right)$

13. $\lim_{x\to 6}(-2x)$

14. $\lim_{x\to -3}(x+6)$

15. $\lim_{x\to 3}\left(x^2-2x+3\right)$

16. $\lim_{x\to -1}\left(5-2x^2\right)$

17. $\lim_{x\to 3}\sqrt{x^2+16}$

18. $\lim_{x\to -1}\sqrt{x^2-3x+5}$

19. $\lim_{x\to 2}\left[(x-3)(x+1)(x-4)\right]$

20. $\lim_{x\to -2}\left[(x+3)^3(x-2)^2\right]$

21. $\lim_{x\to 2}\left(\frac{4}{x}\right)$

22. $\lim_{x\to -3}\left(\frac{-9}{x}\right)$

23. $\lim_{x\to 4}\left[\dfrac{x+3}{x+5}\right]$

24. $\lim_{x\to 0}\left[\dfrac{2x+5}{x-3}\right]$

25. $\lim_{x\to \frac{-1}{2}}\sqrt[3]{6x+2}$

26. $\lim_{x\to 4}\left(3+\sqrt[3]{5x+7}\right)$

27. $\lim_{x\to 1}\left[\dfrac{3x+\sqrt{x^2+6x+2}}{6-\sqrt{5-x^2}}\right]$

28. $\lim_{x\to -2}\left[\dfrac{2x\sqrt{x-9x}}{4+\sqrt{x^2+2x+1}}\right]$

29. $\lim_{t\to 4}\left[\dfrac{t+3}{t-4}\right]$

30. $\lim_{x\to 0}\left[\dfrac{7x+9}{x}\right]$

31. $\lim_{t\to 5}\left[\dfrac{t-5}{t+1}\right]$

32. $\lim_{x\to 0}\left[\dfrac{x^2-7x}{x+3}\right]$

33. $\lim_{x\to 0}\left(\dfrac{x^2+3x}{4x}\right)$

34. $\lim_{x\to 0}\left(\dfrac{6x^2-8x}{x}\right)$

35. $\lim_{x\to 5}\left(\dfrac{x^2-25}{x-5}\right)$

36. $\lim_{x\to 2}\left(\dfrac{x^2+2x-8}{x-2}\right)$

37. $\lim_{x\to -3}\left(\dfrac{x+3}{x^2+5x+6}\right)$

38. $\lim_{x\to -3}\left(\dfrac{x+3}{x^2-9}\right)$

39. $\lim_{x\to 1}\left(\dfrac{x^2-5x+4}{x^2+x-2}\right)$

40. $\lim_{x\to -3}\left(\dfrac{x^2-x-12}{x^2+7x+12}\right)$

41. $\lim_{x\to 1}\left(\dfrac{x^2+3x-10}{x^2-4}\right)$

42. $\lim_{x\to 3}\left(\dfrac{x^3-2x^2}{x^2}\right)$

43. $\lim_{x\to 0}\left(\dfrac{(x-3)(x+1)}{x(x+1)}\right)$

44. $\lim_{x\to 5}\left(\dfrac{x^2-9}{(x+3)(x-5)}\right)$

45. $\lim_{x\to 0}\left(\dfrac{\sqrt{x+3}-\sqrt{3}}{x}\right)$

46. $\lim_{x\to 0}\left(\dfrac{\sqrt{x+1}-1}{x}\right)$

For problems 47 – 50, sketch the piecewise defined function and find $\lim_{x\to c} f(x)$ or state that it does not exist at the indicated value.

47. $f(x)=\begin{cases} x^2-3, & x\le 2 \\ \frac{1}{2}x, & x>2 \end{cases}$ at $c = 2$.

48. $f(x)=\begin{cases} 2x+5, & x<-2 \\ x+4, & x\ge -2 \end{cases}$ at $c=-2$.

49. $f(x)=\begin{cases} x^2+3x-4, & x\le 1 \\ 5x-3, & x>1 \end{cases}$ at $c = 1$.

50. $f(x)=\begin{cases} x^2-3x-7, & x\le 1 \\ -5-4x, & x>1 \end{cases}$ at $c = 1$.

For problems 51 – 58, fill in the table of values for each function. Then use the table of values to determine whether or not $\lim_{x\to c} f(x)$ exists. If the limit exists, state the value.

51. $f(x)=2x+1, c=2$

x	1.9	1.99	1.999	2	2.001	2.01	2.1
$f(x)$							

52. $f(x)=x^2-2, c=1$

x	0.9	0.99	0.999	1	1.001	1.01	1.1
$f(x)$							

53. $f(x)=\dfrac{3}{x-4}, c=4$

x	3.9	3.99	3.999	4	4.001	4.01	4.1
$f(x)$							

54. $f(x)=\dfrac{3}{2x-1}, c=\dfrac{1}{2}$

x	0.49	0.499	0.4999	0.5	0.5001	0.501	0.51
$f(x)$							

55. $f(x)=\dfrac{x+1}{x^2-1}, c=-1$

x	−1.1	−1.01	−1.001	−1	−0.999	−0.99	−0.9
$f(x)$							

56. $f(x)=\dfrac{x-3}{x^2-x-6}, c=-2$

x	−2.1	−2.01	−2.001	−2	−1.999	−1.99	−1.9
$f(x)$							

57. $f(x)=\dfrac{|x+1|}{x+1}, c=-1$

x	−1.1	−1.01	−1.001	−1	−0.999	−0.99	−0.9
$f(x)$							

58. $f(x)=\dfrac{|x-5|}{x-5}, c=5$

x	4.9	4.99	4.999	5	5.001	5.01	5.1
$f(x)$							

For problems 59 – 66, use the table feature of a graphing calculator to find the limit, if it exists. Use the value *c* for the TblStart value and a ΔTbl of 0.001.

59. $\lim_{x\to 2}\left(\dfrac{x^3-8}{x-2}\right), c=2$

60. $\lim_{x\to 1}\left(\dfrac{x^3+4x^2-6x+1}{x-1}\right), c=1$

61. $\lim_{x\to 0}\left(\dfrac{2^{2x}+3\cdot 2^x-4}{2^x-1}\right), c=0$

62. $\lim_{x\to 2}\left(\dfrac{3^{3x}-9\cdot 3^{2x}+2\cdot 3^x-18}{3^x-9}\right), c=2$

63. $\lim_{x\to 2}\left(\dfrac{\sqrt{x^2+4}}{x-2}\right), c=2$

64. $\lim\limits_{x\to 3}\left(\dfrac{\sqrt{x^2+5x+6}}{x-3}\right), c=3$

65. $\lim\limits_{x\to 1} f(x)$ if $f(x)=\begin{cases}2x+1, & x\le 1\\ x^2+1, & x>1\end{cases}$, $c=1$

66. $\lim\limits_{x\to -3} f(x)$ if $f(x)=\begin{cases}x^2+5x, & x\le -3\\ 3x+3, & x>-3\end{cases}$, $c=-3$