SWOK

Infinite Limits 27-36, 37-40
11-24

Exer. 11–24: Find the limit, if it exists.

11 $\lim_{x\to\infty} \dfrac{5x^2 - 3x + 1}{2x^2 + 4x - 7}$

12 $\lim_{x\to\infty} \dfrac{3x^3 - x + 1}{6x^3 + 2x^2 - 7}$

13 $\lim_{x\to-\infty} \dfrac{4 - 7x}{2 + 3x}$

14 $\lim_{x\to-\infty} \dfrac{(3x + 4)(x - 1)}{(2x + 7)(x + 2)}$

15 $\lim_{x\to-\infty} \dfrac{2x^2 - 3}{4x^3 + 5x}$

16 $\lim_{x\to\infty} \dfrac{2x^2 - x + 3}{x^3 + 1}$

17 $\lim_{x\to\infty} \dfrac{-x^3 + 2x}{2x^2 - 3}$

18 $\lim_{x\to-\infty} \dfrac{x^2 + 2}{x - 1}$

19 $\lim_{x\to-\infty} \dfrac{2 - x^2}{x + 3}$

20 $\lim_{x\to\infty} \dfrac{3x^4 + x + 1}{x^2 - 5}$

21 $\lim_{x\to\infty} \sqrt[3]{\dfrac{8 + x^2}{x(x + 1)}}$

22 $\lim_{x\to-\infty} \dfrac{4x - 3}{\sqrt{x^2 + 1}}$

23 $\lim_{x\to\infty} \sin x$

24 $\lim_{x\to\infty} \cos x$

c Exer. 25–26: Investigate the limit by letting $x = 10^n$ for $n = 1, 2, 3$, and 4.

25 $\lim_{x\to\infty} \dfrac{1}{x} \tan\left(\dfrac{\pi}{2} - \dfrac{1}{x}\right)$

26 $\lim_{x\to\infty} \sqrt{x} \sin\dfrac{1}{x}$

Exer. 27–36: Find the vertical and horizontal asymptotes for the graph of f.

27 $f(x) = \dfrac{1}{x^2 - 4}$

28 $f(x) = \dfrac{5x}{4 - x^2}$

29 $f(x) = \dfrac{2x^2}{x^2 + 1}$

30 $f(x) = \dfrac{3x}{x^2 + 1}$

31 $f(x) = \dfrac{1}{x^3 + x^2 - 6x}$

32 $f(x) = \dfrac{x^2 - x}{16 - x^2}$

33 $f(x) = \dfrac{x^2 + 3x + 2}{x^2 + 2x - 3}$

34 $f(x) = \dfrac{x^2 - 5x}{x^2 - 25}$

35 $f(x) = \dfrac{x + 4}{x^2 - 16}$

36 $f(x) = \dfrac{\sqrt[3]{16 - x^2}}{4 - x}$

Exer. 37–40: A function f satisfies the given conditions. Sketch a possible graph for f, assuming that it does not cross a horizontal asymptote.

37 $\lim_{x\to-\infty} f(x) = 1$; $\lim_{x\to\infty} f(x) = 1$;
$\lim_{x\to3^-} f(x) = -\infty$; $\lim_{x\to3^+} f(x) = \infty$

38 $\lim_{x\to-\infty} f(x) = -1$; $\lim_{x\to\infty} f(x) = -1$;
$\lim_{x\to2^-} f(x) = \infty$; $\lim_{x\to2^+} f(x) = -\infty$

39 $\lim_{x\to-\infty} f(x) = -2$; $\lim_{x\to\infty} f(x) = -2$;
$\lim_{x\to3^-} f(x) = \infty$; $\lim_{x\to3^+} f(x) = -\infty$;
$\lim_{x\to-1^-} f(x) = -\infty$; $\lim_{x\to-1^+} f(x) = \infty$

40 $\lim_{x\to-\infty} f(x) = 3$; $\lim_{x\to\infty} f(x) = 3$;
$\lim_{x\to1^-} f(x) = \infty$; $\lim_{x\to1^+} f(x) = -\infty$;
$\lim_{x\to-2^-} f(x) = -\infty$; $\lim_{x\to-2^+} f(x) = \infty$

41 Salt water of concentration 0.1 pound of salt per gallon flows into a large tank that initially contains 50 gallons of pure water.

(a) If the flow rate of salt water into the tank is 5 gallons per minute, find the volume $V(t)$ of water and the amount $A(t)$ of salt in the tank after t minutes.

(b) Find a formula for the salt concentration $c(t)$ (in lb/gal) after t minutes.

(c) What happens to $c(t)$ over a long period of time?

42 An important problem in fishery science is predicting next year's adult breeding population R (the recruits) from the number S that are presently spawning. For some species (such as North Sea herring), the relationship between R and S is given by $R = aS/(S + b)$, where a and b are positive constants. What happens as the number of spawners increases?

Infinite Limit Wkst Key (SWOK #11-24, 27-40)

11. 5/2 12. ½ 13. -7/3 14. 3/2 15. 0 16. 0 17. -∞ 18. -∞ 19. ∞ 20. ∞ 21. 1 22. -4
23. DNE 24. DNE 27. $x = 2, x = -2, y = 0$ 28. $x = 2, x = -2, y = 0$ 29. $y = 2$ 30. $y = 0$
31. $x = 0, x = 2, x = -3, y = 0$ 32. $x = 4, x = -4, y = -1$ 33. $x = -3, x = 1, y = 1$ 34. $x = -5, y = 1$
35. $x = 4, y = 0$ 36. $x = 4$ $y = 0$ (37-40 discuss in class)