

## 1.5 Infinite Limits

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Assigned Problems: 2, 4, 14, 28, 34, 36, 38, 42, 50, 62, 64, 68, 72, 74, 76

### 1.5.1 Question 2

*Determine whether  $f(x)$  approaches  $+\infty$  or  $-\infty$  as  $x$  approaches 4 from the left and from the right.*

$$f(x) = \frac{-1}{x-4}$$

### 1.5.2 Question 4

*Determine whether  $f(x)$  approaches  $+\infty$  or  $-\infty$  as  $x$  approaches 4 from the left and from the right.*

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

**1.5.3 Question 14**

*Find the vertical asymptotes (if any) of the graph of the function.*

$$f(x) = \frac{4}{(x - 2)^3}$$

**1.5.4 Question 28**

*Find the vertical asymptotes (if any) of the graph of the function.*

$$h(t) = \frac{t^2 - 2t}{t^4 - 16}$$

### 1.5.5 Question 34

*Determine whether the graph of the function has a vertical asymptote or a removable discontinuity at  $x = -1$ . Use your graphing calculator to confirm your answer*

$$f(x) = \frac{x^2 - 6x - 7}{x + 1}$$

### 1.5.6 Question 36

*Determine whether the graph of the function has a vertical asymptote or a removable discontinuity at  $x = -1$ . Use your graphing calculator to confirm your answer*

$$f(x) = \frac{\sin(x + 1)}{x + 1}$$

**1.5.7 Question 38**

*Find the limit (if it exists):*  $\lim_{x \rightarrow 1^-} \frac{-1}{(x - 1)^2}$

**1.5.8 Question 42**

*Find the limit (if it exists):*  $\lim_{x \rightarrow 4^-} \frac{x^2}{x^2 + 16}$

**1.5.9 Question 50**

*Find the limit (if it exists):*  $\lim_{x \rightarrow (\pi/2)^+} \left( \frac{-2}{\cos x} \right)$

**1.5.10 Question 62**

*Does the graph of every rational function have a vertical asymptote? Explain.*

**1.5.11 Question 64**

*Given a polynomial  $p(x)$ , is it true that the graph of the function given by  $f(x) = \frac{p(x)}{x - 1}$  has a vertical asymptote at  $x = 1$ ? Why or why not?*

**1.5.12 Question 68**

*A 25-foot ladder is leaning against a house (figure in textbook, not important). If the base of the ladder is pulled away from the house at a rate of 2 feet per second, the top will move down the wall at a rate of  $r = \frac{2x}{\sqrt{625 - x^2}}$  ft/s, where x is the distance between the base of the ladder and the house.*

1. Find the rate  $r$  when  $x$  is 7 feet.
2. Find the rate  $r$  when  $x$  is 15 feet.
3. Find the limit of  $r$  as  $x \rightarrow 25^-$

**1.5.13 Question 72**

*A crossed belt connects a 20-centimeter pulley (10-cm radius) on on a saw arbor (figure in textbook, not important). The electric motor runs at 1700 revolutions per minute.*

1. Determine the number of revolutions per minute of the saw.
2. How does crossing the belt affect the saw in relation to the motor?
3. Let  $L$  be the total length of the belt. Write  $L$  as a function of  $\phi$ , where  $\phi$  is measured in radians. What is the domain of the function? (*Hint:* Add the lengths of the straight section of the belt and the length of the belt around each pulley.)

**1.5.14 Question 74**

*True or False? If false, explain why or give an example that shows it is false*

The graphs of polynomial functions have no vertical asymptotes.

**1.5.15 Question 76**

*True or False? If false, explain why or give an example that shows it is false*

If  $f$  has a vertical asymptote at  $x = 0$ , then  $f$  is undefined at  $x = 0$