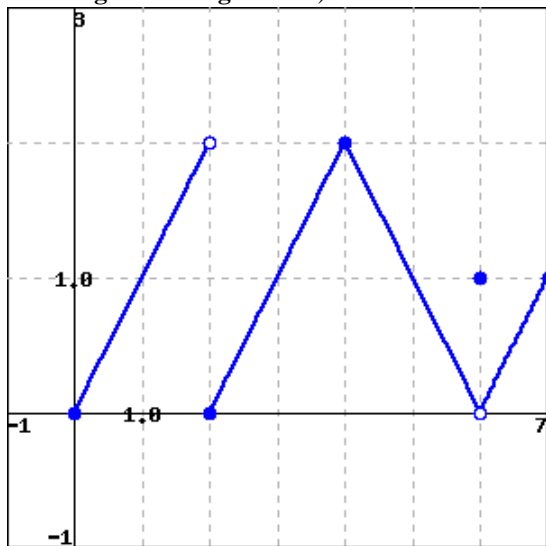


Principles of Calculus Modeling: An Interactive Approach by Donald Kreider, Dwight Lahr, and Susan Diesel  
Exercises for Section 2.3

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1. (1 pt)

For the function  $f(x)$  graphed below, find each of the following limits. If a limit does not exist, type **DNE**, without quotes. (Click image for a larger view.)



$\lim_{x \rightarrow 2^-} f(x) =$  \_\_\_\_\_  
 $\lim_{x \rightarrow 2^+} f(x) =$  \_\_\_\_\_  
 $\lim_{x \rightarrow 2} f(x) =$  \_\_\_\_\_  
 $\lim_{x \rightarrow 4} f(x) =$  \_\_\_\_\_  
 $\lim_{x \rightarrow 6} f(x) =$  \_\_\_\_\_

2. (1 pt)

Evaluate  $\lim_{t \rightarrow -3} \frac{t^2}{3-t}$ . If the limit does not exist, enter **DNE**, without quotes.

3. (1 pt)

Evaluate  $\lim_{x \rightarrow -7} \frac{x^2 - 49}{x + 7}$ . If the limit does not exist, enter **DNE**, without quotes.

4. (1 pt)

Evaluate  $\lim_{x \rightarrow 4} \frac{|x-4|}{x-4}$ . If the limit does not exist, enter **DNE**, without quotes.

5. (1 pt)

Evaluate  $\lim_{t \rightarrow 4} \frac{t^2 - 16}{t^2 - 8t + 16}$ . If the limit does not exist, enter **DNE**, without quotes.

6. (1 pt)

The limit  $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  arises frequently in the study of calculus. Evaluate this limit for the function  $f(x) = 5x^3 + 5$ .

- \_\_\_\_\_
- A.  $15x^2$
- B.  $x^2$
- C. 1
- D.  $15x^2 + 5$
- E. The limit does not exist.

7. (1 pt)

The limit  $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$  arises frequently in the study of calculus. Evaluate this limit for the function  $f(x) = 10\sqrt{x}$ . If the limit does not exist, enter **DNE**, without quotes.

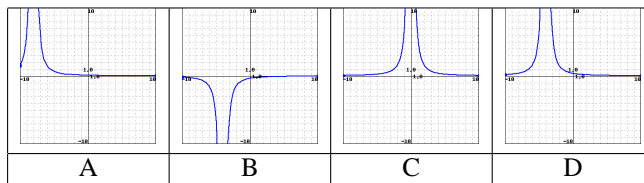
8. (1 pt)

Find  $\lim_{x \rightarrow 1^+} \frac{|x-1|}{x^2-1}$ . If the limit does not exist, enter **DNE**, without quotes.

9. (1 pt)

Let  $f(x) = \frac{6}{(-4-x)^2}$ . Find  $\lim_{x \rightarrow -4} f(x)$ . If the limit does not exist, is it the limit  $\infty$ ? enter **infinity**,  $-\infty$ ? enter **-infinity**, or neither? enter **neither**. Do not type quotes in your answer.

Which of the following graphs is the graph of  $f(x)$ ? Click the graphs to see a larger view.



What asymptotes, if any, does the graph of  $f(x)$  have? Use only the answer blanks you need.

Enter vertical asymptotes from smallest value to largest.

$x =$  \_\_\_\_\_

$x =$  \_\_\_\_\_

$x =$  \_\_\_\_\_

Enter other asymptotes in the form  $mx + b$ , where values of  $m$  go from smallest to largest.

$y =$  \_\_\_\_\_

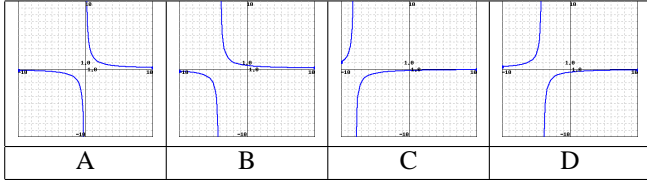
$y =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

10. (1 pt)

Let  $f(x) = \frac{2}{-4-x}$ . Find  $\lim_{x \rightarrow -4^+} f(x)$ . If it does not exist, is it the limit  $\infty$ ? enter **infinity**,  $-\infty$ ? enter **-infinity**, or neither? enter **neither**. Do not type quotes in your answer.

Which of the following graphs is the graph of  $f(x)$ ? Click the graphs to see a larger view.



What asymptotes, if any, does the graph of  $f(x)$  have? Use only the answer blanks you need.

Enter vertical asymptotes from smallest value to largest.

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$x =$  \_\_\_\_\_

$x =$  \_\_\_\_\_

Enter other asymptotes in the form  $mx + b$ , where values of  $m$  go from smallest to largest.

$y =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

11. (1 pt)

Find the following limit.

$$\lim_{x \rightarrow 8^+} \frac{5x + 9}{7x^2 - 47x - 72}$$

If it does not exist, is it the limit  $\infty$ ? enter **infinity**,  $-\infty$ ? enter **-infinity**, or neither? enter **neither**. Do not type quotes in your answer.

12. (1 pt)

Evaluate the limit  $\lim_{x \rightarrow 8} \frac{x^2 + 15x + 56}{x + 8}$ .

13. (1 pt)

What is  $\lim_{x \rightarrow 7^+} \frac{|x|}{x}$ ?

14. (1 pt)

On August 9th, 1812, The USS Constitution ("Old Ironsides") was fighting a pitched naval battle against the HMS Guerriere. The velocity of the cannonballs being fired from Guerriere's cannons can be described by the equation  $185 - 0.009x^2$  feet per second, where  $x$  is the number of feet the cannonball is from the Guerriere. As the U.S.S. Constitution closed to within 50 feet of the British vessel, what was the limit of the the velocity of the cannonballs striking its hull?

\_\_\_\_\_ feet per second

15. (1 pt)

Let  $\lim_{x \rightarrow c} f(x) = 4$ . Let  $g(x) = -3x^2 - 10x + 3$ . What is  $\lim_{x \rightarrow c} g(f(x))$ ?

16. (1 pt)

Evaluate the limit  $\lim_{x \rightarrow 0} x^3 + \frac{\sin 9x}{100000}$ .

17. (1 pt)

Let  $\lim_{x \rightarrow c} f(x) = 4$ . Let  $\lim_{x \rightarrow c} g(x) = -5x^3 - 4x$ . Let  $h(x) = \frac{g(f(x))}{g(f(x))}$ .

What is  $\lim_{x \rightarrow c} h(g(f(x)))$ ?