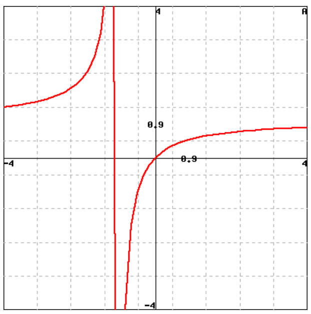
---

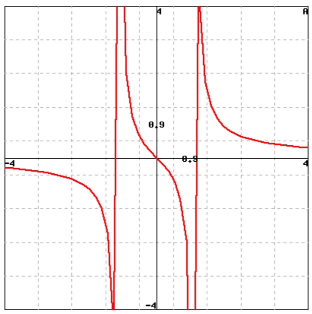
1. (1 point)

Match the graphs with the corresponding formulas.

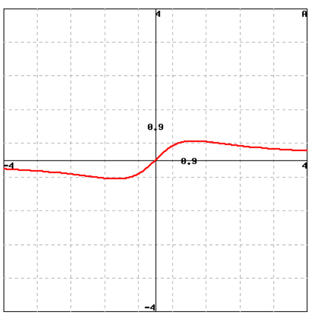
[?] 1. f(x) = $1/(x-1)^2$
[?] 2. f(x) = $1/(x^2-1)$
[?] 3. f(x) = $x/(x-1)^2$
[?] 4. f(x) = $x/(x^2-1)$
[?] 5. f(x) = $x/(x+1)$
[?] 6. f(x) = $x/(x^2+1)$



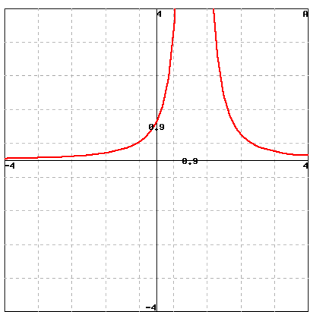
A



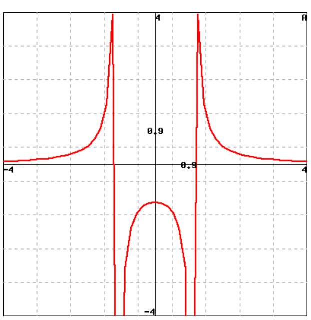
B



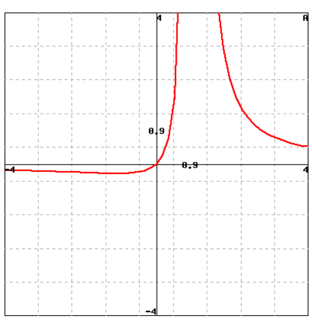
C



D



E



F

(Click on a graph to enlarge it)

Solution:
SOLUTION

The formulas match as follows: 1 matches graph D,
2 matches graph E,
3 matches graph F,
4 matches graph B,
5 matches graph A, and
6 matches graph C.

Answer(s) submitted:

- D
- E
- F
- B
- A
- C

(correct)

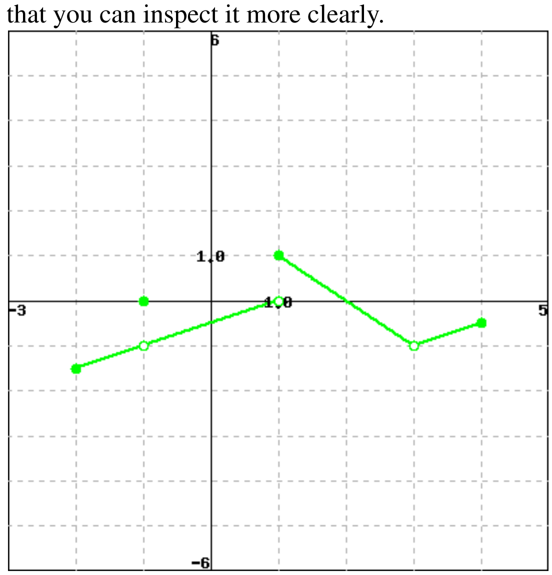
Correct Answers:

- D
- E
- F
- B
- A
- C

---

2. (1 point) Let F be the function below.

If you are having a hard time seeing the picture clearly, click on the picture. It will expand to a larger picture on its own page so that you can inspect it more clearly.



Evaluate each of the following expressions.

Note: Enter 'DNE' if the limit does not exist or is not defined.

a) $\lim_{x\to -1^-} F(x) =$ ____

$\lim_{x\to -1^+} F(x) =$ ____

$\lim_{x\to -1} F(x) =$ ____

$F(-1) =$ ____
b) $\lim_{x\to 1^-} F(x) =$ ____
$\lim_{x\to 1^+} F(x) =$ ____
$\lim_{x\to 1} F(x) =$ ____
$F(1) =$ ____
c) $\lim_{x\to 3^-} F(x) =$ ____
$\lim_{x\to 3^+} F(x) =$ ____
$\lim_{x\to 3} F(x) =$ ____
$F(3) =$ ____

Solution:
SOLUTION
The correct answers are:
a) -1, -1, -1, 0
b) 0, 1, DNE, 1
c) -1, -1, -1, DNE

Answer(s) submitted:

- `-1`
- `-1`
- `-1`
- `0`
- `0`
- `1`
- `DNE`
- `1`
- `-1`
- `-1`
- `-1`
- `DNE`

(correct)
Correct Answers:

- `-1`
- `-1`
- `-1`
- `0`
- `0`
- `1`
- `DNE`
- `1`
- `-1`
- `-1`
- `-1`
- `DNE`

---

3. (1 point) Given $\lim_{x\to 4} f(x) = 3$ and $\lim_{x\to 4} g(x) = 5$, evaluate

$$\lim_{x\to 4} \frac{g(x) - f(x)}{8g(x)}.$$

If the limit does not exist enter DNE.
Limit = ____________

Solution:
SOLUTION
The correct answer is '0.05'.

Answer(s) submitted:

- `1/20`

(correct)
Correct Answers:

- `0.05`

---

4. (1 point) Evaluate the limit

$$\lim_{x\to -3} \frac{x^2+9x+18}{x+3}$$

If the limit does not exist enter DNE.
Limit = ____________

Solution:
SOLUTION
$\lim_{x\to -3} \frac{x^2+9x+18}{x+3}$
$\lim_{x\to -3} \frac{(x+3)^2}{x+3}$
$\lim_{x\to -3} (x+3)$
$= 0$
There is a hole at $x = -3$, but the limit does exist. The answer is '3'.

Answer(s) submitted:

- `3`

(correct)
Correct Answers:

- `3`

---

5. (1 point)
What is wrong with the following equation?

$$\frac{x^2+x-6}{x-2} = x+3$$

Choose one of the following and enter the letter below:
(a) There is nothing wrong with this equation.
(b) This equation does not make sense at $x = 2$.
(c) None of the above.

____

Answer(s) submitted:

- `b`

(correct)
Correct Answers:

- `b`

---

6. (1 point) Given $\lim_{x\to 4} g(x) = 6$, evaluate

$$\lim_{x\to 4} \sqrt{g(x)}.$$

(If the limit does not exist, enter "DNE".)
Limit = ____________

Answer(s) submitted:

- `2.449489743`

(correct)
Correct Answers:

- 2.44949

---

7. (1 point) Suppose

$$\lim_{x\to a} g(x) = -1, \quad \lim_{x\to a} f(x) = 0, \quad \lim_{x\to a} h(x) = -1.$$

Find following limits if they exist. Enter **DNE** if the limit does not exist.

___1. $\lim_{x\to a} g(x) + f(x)$
___2. $\lim_{x\to a} g(x) - f(x)$
___3. $\lim_{x\to a} g(x) \cdot h(x)$
___4. $\lim_{x\to a} \frac{g(x)}{f(x)}$
___5. $\lim_{x\to a} \frac{g(x)}{h(x)}$
___6. $\lim_{x\to a} \frac{h(x)}{g(x)}$
___7. $\lim_{x\to a} (f(x))^2$
___8. $\lim_{x\to a} \frac{1}{f(x)}$
___9. $\lim_{x\to a} \frac{1}{f(x) - h(x)}$

Solution:

Solution:

Use 1.3, Theorem 2.

Answer(s) submitted:

- -1
- -1
- 1
- DNE
- 1
- 1
- 0
- DNE
- 1

(correct)

Correct Answers:

- -1
- -1
- 1
- DNE
- 1
- 1
- 0
- DNE
- 1

---

8. (1 point) Let

$$f(x) = \begin{cases} 19 & \text{if } x < -8 \\ -x + 11 & \text{if } -8 \le x < 7 \\ 0 & \text{if } x = 7 \\ 11 & \text{if } x > 7. \end{cases}$$

Sketch the graph of this function and find the following limits, if they exist.
(*If a limit does not exist, enter* **DNE**.)

1. $\lim_{x\to -8^-} f(x)$ = ___
2. $\lim_{x\to -8^+} f(x)$ = ___
3. $\lim_{x\to -8} f(x)$ = ___
4. $\lim_{x\to 7^-} f(x)$ = ___
5. $\lim_{x\to 7^+} f(x)$ = ___
6. $\lim_{x\to 7} f(x)$ = ___

Answer(s) submitted:

- 19
- 19
- 19
- 4
- 11
- DNE

(correct)

Correct Answers:

- 19
- 19
- 19
- 4
- 11
- DNE

---

9. (1 point) Evaluate the limits.

$$q(x) = \begin{cases} a(x-b)^2 + c & x < b \\ a(x-b) + c & x > b \end{cases}$$

Enter **DNE** if the limit does not exist.

a) $\lim_{x\to b^-} q(x)$ = _____
b) $\lim_{x\to b^+} q(x)$ = _____
c) $\lim_{x\to b} q(x)$ = _____
d) $q(b)$ = _____

Answer(s) submitted:

- c
- c
- c
- DNE

(correct)

Correct Answers:

- c
- c
- c
- DNE

10. (1 point) Below is an "oracle" function. An oracle function is a function presented interactively. When you type in a t value, and press the –f–> button the value $f(t)$ appears in the right hand window. There are three lines, so you can calculate three different values of the function at one time.

The function f(t) represents the height in feet of a ball thrown into the air, t seconds after it has been thrown.

Estimate the instantaneous velocity 0.45 seconds after the ball has been thrown by computing the average rate of change between 0.45 and a point near by.

Average velocity at 0.45 = ________ You can use a **calculator**

The java Script calculator was displayed here

Remember this technique for finding velocities. Later we will use the same method to find the derivative of functions such as $f(t)$.

Answer(s) submitted:

- -14.4

(incorrect)

Correct Answers:

- 28.5999839988449

---

11. (1 point) Suppose you deposit 500 dollars into a bank with 6% simple interest. The amount in the account after t years is given by $A(t) = 500(1.06)^t$ (in dollars).

1. What is the average rate of change for the first year?
Rate (in dollars per year): ________

2. What is the average rate of change for the first five years?
Rate (in dollars per year): ________

3. What is the average rate of change for the first ten years?
Rate (in dollars per year): ________

4. Does the average rate of change increase or decrease as time from the initial deposit gets longer?

- choose one
- increases
- decreases
- stays the same

Answer(s) submitted:

- 30
- 33.82255776
- 39.54238483
- increases

(correct)

Correct Answers:

- 500*1.06-500
- (500*1.06^5-500)/5
- (500*1.06^10-500)/10
- increases

---

12. (1 point) Consider a car whose position, s, is given by the table

t (s)	0	0.2	0.4	0.6	0.8	1
s (ft)	0	0.4	1.5	3.8	6.5	9.6

Find the average velocity over the interval $0 \le t \le 0.2$.
average velocity = ____ help (units)

Estimate the velocity at $t = 0.2$.
velocity = ____ help (units)

Solution:

SOLUTION

The average velocity over the interval $0 \le t \le 0.2$ is given by $\frac{s(0.2)-s(0)}{0.2} = \frac{0.4}{0.2} = 2$ ft/s.

The average velocity over the interval $0.2 \le t \le 0.4$ is given by $\frac{s(0.4)-s(0.2)}{0.2} = \frac{1.5-0.4}{0.2} = 5.5$ ft/s.

A reasonable estimate for the velocity at $t = 0.2$ is the average $\frac{1}{2} \cdot (2+5.5) = 3.75$ ft/s.

Answer(s) submitted:

- 2ft/s
- 2ft/s

(correct)

Correct Answers:

- 2 ft/s
- 3.75 ft/s

---

13. (1 point) Evaluate the following limits:

1. $\lim_{x\to\infty} \dfrac{5x^3 - 11x^2 - 6x}{11 - 6x - 4x^3}$ = ________
2. $\lim_{x\to-\infty} \dfrac{5x^3 - 11x^2 - 6x}{11 - 6x - 4x^3}$ = ________

Answer(s) submitted:

- -5/4
- -5/4

(correct)

Correct Answers:

- -1.25
- -1.25

---

14. (1 point)

A function is said to have a **vertical asymptote** wherever the limit on the left or right (or both) is either positive or negative infinity.

For example, the function $f(x) = \dfrac{-3(x+2)}{x^2+4x+4}$ has a vertical asymptote at $x = -2$.

Find each of the following limits.

$\lim_{x\to-2^-} \dfrac{-3(x+2)}{x^2+4x+4} =$ ________ help (limits)

$\lim_{x\to-2^+} \dfrac{-3(x+2)}{x^2+4x+4} =$ ________ help (limits)

$\lim_{x\to-2} \dfrac{-3(x+2)}{x^2+4x+4} =$ ________ help (limits)

Answer(s) submitted:

- `infinity`
- `-infinity`
- `DNE`

(correct)

Correct Answers:

- `infinity`
- `-infinity`
- `DNE`

---

15. (1 point)

A function is said to have a **horizontal asymptote** if either the limit at infinity exists or the limit at negative infinity exists.

Show that each of the following functions has a horizontal asymptote by calculating the given limit.

$\lim_{x\to\infty} \frac{-7x}{2+2x} =$ ____

$\lim_{x\to-\infty} \frac{14x-12}{x^3+5x-7} =$ ____

$\lim_{x\to\infty} \frac{x^2-9x-15}{9-2x^2} =$ ____

$\lim_{x\to\infty} \frac{\sqrt{x^2+14x}}{5-15x} =$ ____

$\lim_{x\to-\infty} \frac{\sqrt{x^2+14x}}{5-15x} =$ ____

Answer(s) submitted:

- `-7/2`
- `0`
- `-1/2`
- `49/110`
- `49/110`

(score 0.600000023841858)

Correct Answers:

- `-3.5`
- `0`
- `-0.5`
- `-0.0666666666666667`
- `0.0666666666666667`