Absolute Value and Reciprocal Functions Litmus Test

Use the following information to answer the first question.

Given the following table of values for y = f(x)

x	y
-2	-19
-1	-15
0	-11
1	-7
2	-3

Consider the possible table of values for y = $|f(x)|$

A			B			C			D	
x	y		x	y		x	y		x	y
-2	19		2	19		-2	-19		2	-19
-1	15		1	15		-1	-15		1	-15
0	11		0	11		0	-11		0	-11
1	7		1	7		-1	-7		1	-7
2	3		2	3		-2	-3		2	-3

1. The correct table of values for y = |f(x)| is

   A) A B) B C) C D) D

Use the following information to answer the next question.

Consider the following statements.

Statement 1	The following 5 numbers are ordered from least to greatest: $\lvert 0.7 \rvert$, 0.9, $\lvert -1.5 \rvert$, 3.1, $\lvert \frac{-11}{2} \rvert$
Statement 2	The value of $\lvert -6 - 2(4) \rvert$ is 2.
Statement 3	$3\lvert 2 - 5 \rvert + -4\lvert 1 - (-2) \rvert = -3$.
Statement 4	The y-intercept of $y = \lvert 3x - 12 \rvert$ is -12.

2. The two true statements are

   A) 1 and 2 B) 3 and 4 C) 1 and 3 D) 2 and 4

3. The absolute value equation, $y = |2x - 18|$ expressed as a piecewise function is

   $y = 2x - 18$, if $x \geq K$
   $y = -(2x - 18)$, if $x < K$.

   The value of K is ___.

4. Which of the following equations has no solution?

   A) $|-x + 8| - 2 = -1$
   B) $\left|\frac{1}{2}x - 12\right| + 5 = 7$
   C) $|4x + 1| - 10 = 0$
   D) $|-3x - 3| + 6 = 1$

5. The extraneous root for the equation $|x + 1| = 2x - 2$ is

   A) -3 B) 3 C) $-\frac{1}{3}$ D) $\frac{1}{3}$

6. The solution(s) to $|x - 7| = x^2 - x - 42$ is/are

   A) 7 B) 7, -7 C) 7, -7, -5 D) 7, -7, -5, 5

7. A school is running a contest to guess the number of round hard candies that are in a large jar. If the exact number happens to be 316 and a potential winning guess must be within ± 4, which absolute value equation will model this situation? [Let G = Guess]

   A) $|G - 4| \leq 316$
   B) $|G + 4| \leq 316$
   C) $|G - 316| \leq 4$
   D) $|G + 316| \leq 4$

Use the following information to answer the next question.

If $f(x) = 3x - 8$, then consider the following statements regarding $y = \frac{1}{f(x)}$

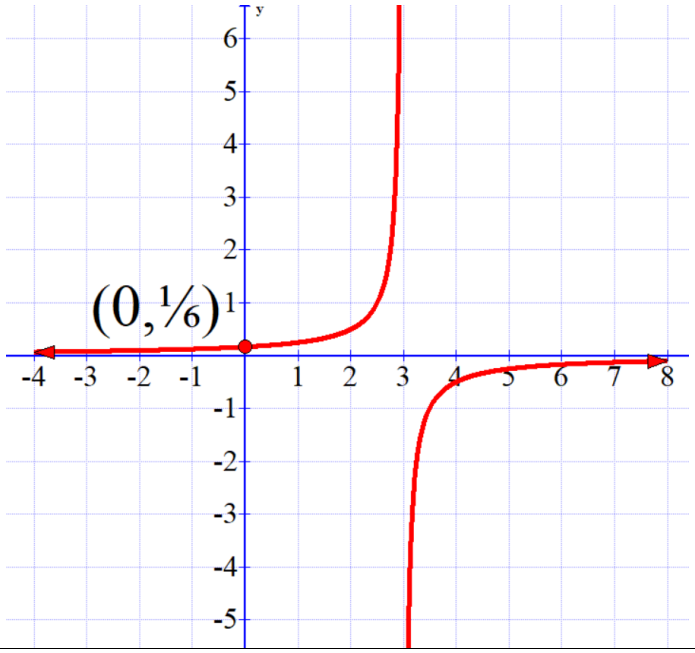
Statement 1	The equation of the vertical asymptote is $x = \frac{8}{3}$.
Statement 2	The invariant points are (3,1) and (7, -1).
Statement 3	The y-intercept is (0, 0.125).
Statement 4	There are no x-intercepts.

8. The two true statements are

   A) 1 and 2 B) 3 and 4 C) 2 and 3 D) 1 and 4

Use the graph below to answer the next question.

The graph is the reciprocal function, $y = \frac{1}{f(x)}$. The equation of the vertical asymptote is x = 3.



9. The equation of y = f(x) is

A) y = 2x + 6 B) y = -2x + 6 C) y = x – 3 D) y = x + 3

Use the following information to answer the next question.

Analyze the vertical asymptotes for the following reciprocal functions.

I	II	III	IV
$f(x) = \frac{1}{6x - 12}$	$f(x) = \frac{1}{x^2 - x - 6}$	$f(x) = \frac{1}{(x-2)(x+7)}$	$f(x) = \frac{1}{x - 2}$

10. The function **not** having a vertical asymptote of x = 2 is

A) I B) II C) III D) IV

11. Given f(x) = x^2 + 8x + 17, and it's reciprocal function $y = \frac{1}{f(x)}$, there will be one invariant point in quadrant two (-x,y). The value of x is ___.

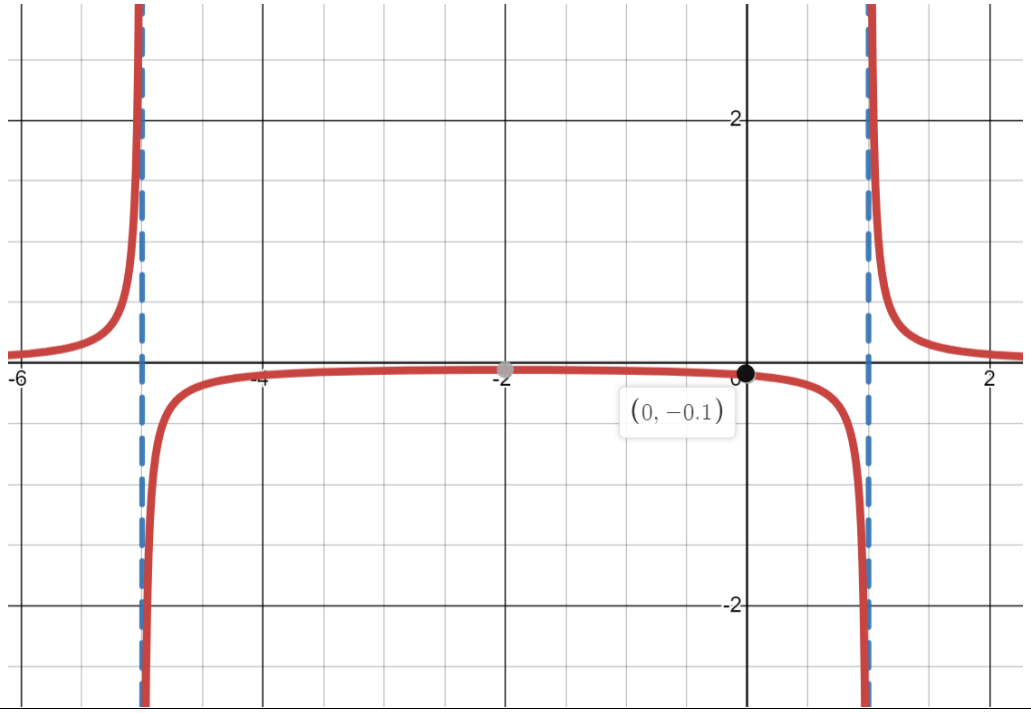
12. If f(x) = x^2 – 25 and g(x) = x^2 – 17x + 60, then y = $\frac{1}{f(x)}$ and y = $\frac{1}{g(x)}$ have one common non-permissible value, which is ____.

13. If the point (4, $\frac{1}{5}$) is on y = f(x), then the corresponding point on $y = \frac{1}{f(x)}$ is

A) $(\frac{1}{4}, \frac{1}{5})$ B) $(\frac{1}{4}, 5)$ C) (4, 5) D) $(4, -\frac{1}{5})$

Use the following graph to answer the next question.

Consider the graph of $y = \frac{1}{f(x)}$ shown below. The y-intercept is (0, -0.1) and the equations of the vertical asymptotes are x = -5 and x = 1.



14. When y = f(x) is written in the form, y = a (x – b) (x + c), the value for *a* is ____.

Written Response

- Write your responses as neatly as possible.
- For full marks, your responses must address **all** aspects of the question.
- All responses, including descriptions and/or explanations of concepts must include pertinent ideas, calculations, formulas, and correct units.
- Your responses must be presented in a in a well-organized manner. For example, you may organize your responses in point form or paragraphs.

WRITTEN RESPONSE 1

- **Illustrate** how the absolute functions, f(x) = |4x + 5| and g(x) = |4x - 5| **compare** in terms of intercepts, domain and range. [2 Marks]

*Illustrate: "*Make clear by giving an example. The form of the example will be specified in the question: e.g., a word description, sketch, or diagram".

Compare: "Examine the character or qualities of two things by providing characteristics of both that point out their mutual similarities and differences".

- Express f(x) = |4x + 5| as a piecewise function. **Explain.** [2 Marks]

Explain: "Make clear what is not immediately obvious or entirely known; give the cause of or reason for; make known in detail".

- **Interpret** $|4x - 5| < 0$, in terms of a solution. [1 Mark].

Interpret: "Provide a meaning of something; present information in a new form that adds meaning to the original data".

- **Solve** the absolute value equation, $|4x + 5| = 9$, **algebraically** and using technology (include a **sketch**). **Verify**. [3 Marks]

Solve: "Give a solution to a problem".

Algebraically: "Using mathematical procedures that involve variables or symbols to represent values".

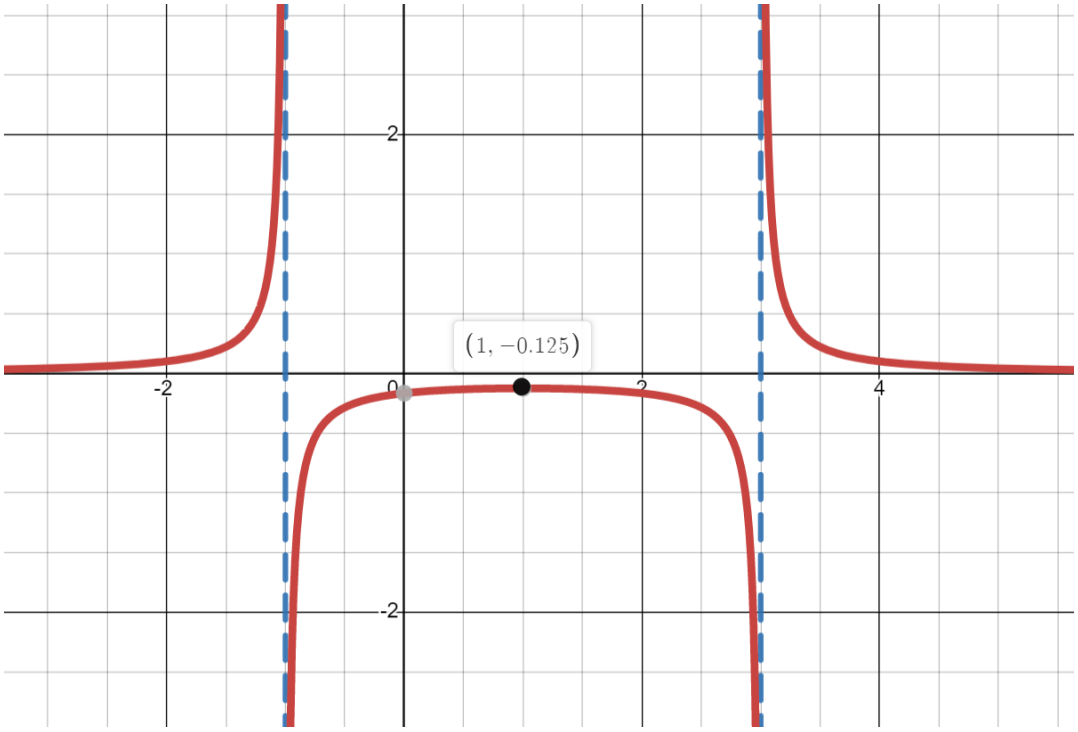
Sketch: "Provide a drawing that represents the key features or characteristics of an object or graph".

Verify: "Establish, by substitution for a particular case or by geometric comparison, the truth of a statement".

WRITTEN RESPONSE 2

Use the following to answer the next question.

A math student was given the following graph of a reciprocal function $y = \frac{1}{f(x)}$ and asked to find the equation of y = f(x).



The student's work is shown below.

Step 1	$y = \frac{1}{a(x+3)(x+1)}$
Step 2	$-0.125 = \frac{1}{a((1)+3)((1)+1)}$
Step 3	$-0.125 = \frac{1}{a(4)(2)}$
Step 4	$8a = \frac{1}{-0.125}$
Step 5	a = -1
Step 6	f(x) = -(x + 3)(x + 1)

- **Analyze** the math student's work. **Determine** and correct the error. [2 Marks]

Analyze: "Make a mathematical examination of parts to determine the nature, proportion, function, interrelationships, and characteristics of the whole".

Determine: "Find a solution, to a specified degree of accuracy, to a problem by showing appropriate formulas, procedures, and/or calculations".

- State the equations of the vertical asymptotes and **describe** how they relate to the non-permissible values. [1 Mark]

Describe: "Give a written account of a concept".

- **Compare** the ranges of y = f(x) and y = $\frac{1}{f(x)}$. [1 Mark]

- **Analyze** the invariant points with respect to their quadrants. **Determine** the invariant point in quadrant 1, accurate to two decimals. [2 Marks]