Log Graph Lab

Sketch logarithmic graphs and name their key features.

HIGH SCHOOL · MA.912.AR.5.8

MA.912.AR.5.8 "Given a table, equation or written description of a logarithmic function, graph that function and determine its key features."

NAME ______________________ DATE ____________

GRAPHING LOG FUNCTIONS

For y = log_b(x-h)+k, the vertical asymptote is x = h, and the domain is x > h. The range is all real numbers. Choose inputs that make x-h equal to powers of the base to plot easy points.

WORKED EXAMPLE

Graph y = log_8(x-12)+4. State the domain, range, and vertical asymptote.

1. Set x-12 = 0, so the vertical asymptote is x = 12.
2. Because x-12 must be positive, the domain is x > 12.
3. Use x-12 = 1 and 8 to get points (13,4) and (20,5).

Answer: Domain: x > 12. Range: all real numbers. Vertical asymptote: x = 12. Points include (13,4) and (20,5).

PRACTICE

5 problems

1. Sketch y = log_3(x+2)-1. State the domain, range, vertical asymptote, and three easy points.

   ANSWER ____________

2. This table represents a logarithmic function. Write its equation, then sketch it and state its vertical asymptote. x: 2, 6, 26 y: 0, 1, 2

   ANSWER ____________

3. Start with y = log_7 x. Shift the graph right 3 units and down 2 units. Write the new equation and state its vertical asymptote.

   ANSWER ____________

4. Sketch y = -log_3(x+1)+2. State the domain, range, vertical asymptote, and whether the graph increases or decreases.

   ANSWER ____________

5. This table represents a logarithmic function. Write its equation, then state the domain and vertical asymptote. x: -2, -1, 1, 5 y: -1, 0, 1, 2

   ANSWER ____________

APPLY IT Show your work

1 A game uses R = log_2(p)+1 to display a player rank score, where p is the player's points measured in hundreds. Sketch R versus p. State the domain, range, vertical asymptote, and three points.

WORK SPACE

ANSWER ______________________

2 A photography club models a brightness index with B = log_10(l)-1, where l is a positive light-level measurement. Sketch B versus l. State the domain, range, vertical asymptote, and three points.

WORK SPACE

ANSWER ______________________

CHALLENGE One step up

CHALLENGE

Sketch y = log_2(3-x)+1. State the domain, range, vertical asymptote, and three points. Explain why the graph decreases as x increases.

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Sketch y = log_3(x+2)-1. State the domain, range, vertical asymptote, and three easy points.	**Domain: x > -2. Range: all real numbers. Vertical asymptote: x = -2. Points: (-1,-1), (1,0), (7,1).**
2	This table represents a logarithmic function. Write its equation, then sketch it and state its vertical asymptote. x: 2, 6, 26 y: 0, 1, 2	**y = log_5(x-1). Vertical asymptote: x = 1. Domain: x > 1. Range: all real numbers.**
3	Start with y = log_7 x. Shift the graph right 3 units and down 2 units. Write the new equation and state its vertical asymptote.	**y = log_7(x-3)-2. Vertical asymptote: x = 3. Domain: x > 3. Range: all real numbers.**
4	Sketch y = -log_3(x+1)+2. State the domain, range, vertical asymptote, and whether the graph increases or decreases.	**Domain: x > -1. Range: all real numbers. Vertical asymptote: x = -1. The graph decreases.**
5	This table represents a logarithmic function. Write its equation, then state the domain and vertical asymptote. x: -2, -1, 1, 5 y: -1, 0, 1, 2	**y = log_2(x+3)-1. Domain: x > -3. Vertical asymptote: x = -3. Range: all real numbers.**

PART 2 · APPLY IT

1. **Domain: p > 0. Range: all real numbers. Vertical asymptote: p = 0. Points: (1,1), (2,2), (4,3).** Use positive values of p because a logarithm input must be positive. Use p = 1, 2, and 4, which are powers of 2.
2. **Domain: l > 0. Range: all real numbers. Vertical asymptote: l = 0. Points: (1/10,-2), (1,-1), (10,0).** The light level must be positive. Use light levels 1/10, 1, and 10, which are powers of 10.

CHALLENGE

Domain: x < 3. Range: all real numbers. Vertical asymptote: x = 3. Points: (2,1), (1,2), (-1,3). The graph decreases because 3-x gets smaller as x increases, so the logarithm output gets smaller.

Accept equivalent point sets that lie on the function and accurate sketches with the correct asymptote and direction. For domains, accept inequality notation or interval notation.