Which Side?

Use an intercept to predict and graph an exponential curve.

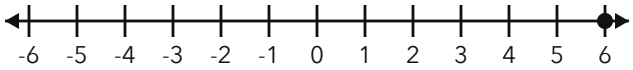
A1P.AF.H.30.c "Graph exponential functions, showing intercepts and end behavior."

NAME _____ DATE _____

ABOVE THE X-AXIS

For $y = a \cdot 2^x$, a positive value of a gives a y-intercept above the x-axis. The graph approaches 0 on the left and rises without bound on the right.

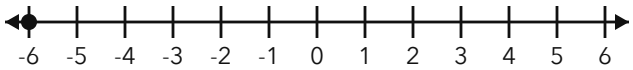
If a = 6, graph $y = 6 \cdot 2^x$ with y-intercept (0, 6).



BELOW THE X-AXIS

For $y = a \cdot 2^x$, a negative value of a gives a y-intercept below the x-axis. The graph approaches 0 on the left and falls without bound on the right.

If a = -6, graph $y = -6 \cdot 2^x$ with y-intercept (0, -6).



1 SORT

8 items

For each figure, treat the marked number as a in $y = a \cdot 2^x$ and circle ABOVE or BELOW; for Part 2, choose one item from each category, sketch both graphs, label their y-intercepts, and explain how you knew where each graph belongs.

1.

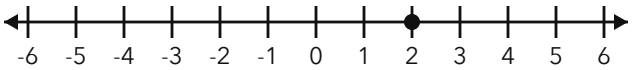


Figure 1

ABOVE BELOW

2.

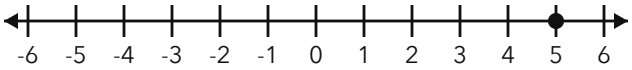


Figure 2

ABOVE BELOW

3.



Figure 3

ABOVE BELOW

4.



Figure 4

ABOVE BELOW

5.

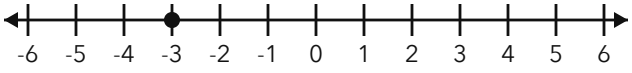


Figure 5

ABOVE BELOW

6.

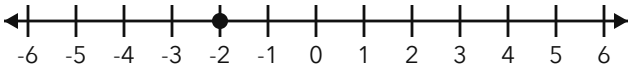


Figure 6

ABOVE **BELOW**

7.

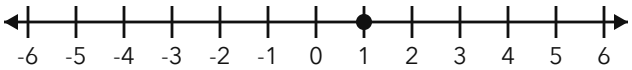


Figure 7

ABOVE **BELOW**

8.

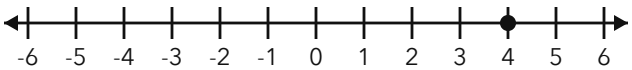


Figure 8

ABOVE **BELOW**

2 PROVE IT

Explain your thinking

Choose one item from each category, sketch both graphs, label their y-intercepts, and explain how you knew where each graph belongs.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new equation of the form $y = a \cdot 2^x$ for each category, using values of a not shown above; sketch each graph, label its y-intercept, and describe what happens at both ends.

ABOVE

BELOW

CHALLENGE

Choose a negative marked value from Part 1 as a and graph $y = a \cdot (1/2)^x$; label its y-intercept and describe what happens at both ends.

Which Side?

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	Figure 1 (numberline)	**ABOVE**	a = 2, so the y-intercept is (0, 2) and the graph stays above the x-axis.
2	Figure 2 (numberline)	**ABOVE**	a = 5, so the y-intercept is (0, 5) and the graph stays above the x-axis.
3	Figure 3 (numberline)	**BELOW**	a = -1, so the y-intercept is (0, -1) and the graph stays below the x-axis.
4	Figure 4 (numberline)	**ABOVE**	a = 3, so the y-intercept is (0, 3) and the graph stays above the x-axis.
5	Figure 5 (numberline)	**BELOW**	a = -3, so the y-intercept is (0, -3) and the graph stays below the x-axis.
6	Figure 6 (numberline)	**BELOW**	a = -2, so the y-intercept is (0, -2) and the graph stays below the x-axis.
7	Figure 7 (numberline)	**ABOVE**	a = 1, so the y-intercept is (0, 1) and the graph stays above the x-axis.
8	Figure 8 (numberline)	**ABOVE**	a = 4, so the y-intercept is (0, 4) and the graph stays above the x-axis.

PART 2 · PROVE IT

Task: Choose one item from each category, sketch both graphs, label their y-intercepts, and explain how you knew where each graph belongs.
Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **ABOVE**: $y = 7 \cdot 2^x$. Plot (-1, 3.5), (0, 7), and (1, 14), then draw a smooth curve through them. The y-intercept is (0, 7); the graph approaches 0 from above on the left and rises without bound on the right.
- **BELOW**: $y = -7 \cdot 2^x$. Plot (-1, -3.5), (0, -7), and (1, -14), then draw a smooth curve through them. The y-intercept is (0, -7); the graph approaches 0 from below on the left and falls without bound on the right.

Challenge: Using a = -2 gives $y = -2 \cdot (1/2)^x$. Plot (-1, -4), (0, -2), and (1, -1), then draw a smooth curve through them. The y-intercept is (0, -2); the graph falls without bound on the left and approaches 0 from below on the right.

For Part 2, accept graphs with the correct y-intercept, the horizontal asymptote y = 0, and the stated left and right behavior. A graph in Part 3 or the challenge should pass through the listed points and approach, but never touch, the x-axis.