Spot the Family

Sort the functions, then choose two items and explain how you knew.

A1P.AF.H "Functions that are members of the same family have distinguishing attributes (structure) common to all functions within that family."

NAME _____ DATE _____

LINEAR

In a linear function, x is multiplied by a fixed number. The output changes by the same amount each time x increases by 1.

$y = 7x - 4$

EXPONENTIAL

In an exponential function, x is the exponent on a fixed number. The output is multiplied by the same number each time x increases by 1.

$y = 9(3)^x$

1 SORT

8 items

For each numbered function, circle LINEAR or EXPONENT based on where x appears.

1. $y = -3x + 8$ LINEAR EXPONENT

2. $y = 4x - 11$ LINEAR EXPONENT

3. $y = 6(2)^x$ LINEAR EXPONENT

4. $y = (1/2)x + 3$ LINEAR EXPONENT

5. $y = 12(1/3)^x$ LINEAR EXPONENT

6. $y = -2(4)^x$ LINEAR EXPONENT

7. $y = 10 - 5x$ LINEAR EXPONENT

8. $y = -x - 6$ LINEAR EXPONENT

2 PROVE IT

Explain your thinking

Pick two items from Part 1. For each one, tell how you knew where it belonged.

ITEM # _____ **HOW I KNEW** _____

ITEM # _____ **HOW I KNEW** _____

3 MAKE YOUR OWN

One of each

Write one new linear function and one new exponential function. Do not copy a function on this page.

LINEAR _____

EXPONENT _____

CHALLENGE

Write one linear function and one exponential function that have the same output when x = 0. Explain how you know.

ANSWER KEY # Spot the Family

PART 1 · SORT

#	ITEM	CATEGORY	WHY
1	$y = -3x + 8$	**LINEAR**	x is multiplied by -3.
2	$y = 4x - 11$	**LINEAR**	x is multiplied by 4.
3	$y = 6(2)^x$	**EXPONENT**	x is the exponent on 2.
4	$y = (1/2)x + 3$	**LINEAR**	x is multiplied by 1/2.
5	$y = 12(1/3)^x$	**EXPONENT**	x is the exponent on 1/3.
6	$y = -2(4)^x$	**EXPONENT**	x is the exponent on 4.
7	$y = 10 - 5x$	**LINEAR**	x is multiplied by -5.
8	$y = -x - 6$	**LINEAR**	x is multiplied by -1.

PART 2 · PROVE IT

Accept any explanation that names the deciding feature from the rule box for the chosen item.

PART 3 · MAKE YOUR OWN (SAMPLE ANSWERS)

- **LINEAR**: $y = 2x + 9$
- **EXPONENT**: Exponential: $y = 7(5)^x$

Challenge: Linear: $y = 6x + 1$. Exponential: $y = 1(5)^x$. When $x = 0$, both outputs are 1. In the first function, x is multiplied by 6. In the second, x is an exponent.

For the two explanations in Part 2, look for a reference to x being multiplied by a fixed number or serving as an exponent. In the challenge, other pairs are valid if they belong to different families and have equal outputs at $x = 0$.