

keep scrolling to get
a sneak peek!

Help your Algebra 2 students
practice **identifying
transformations of exponential
functions**. Students will be eager
to get the self-checking benefits
from this circuit activity!

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS

Differentiated Circuit Worksheet

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS CIRCUIT

is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

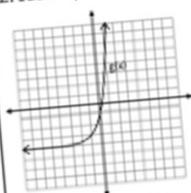
9 → 2 → 10 → 3 → 8 → 5 → 6 → 7 →

1 → _____ → _____ → _____ → _____ → _____ → _____

Previous Answer: Vertical stretch by 7, reflection over the y-axis, down 1 unit.

2. Identify the transformation(s) of $g(x)$

over x-axis stretch by 4 units



Previous Answer: Reflection over x-axis by 4, right 2 units.

4. Identify the transformation(s) of $g(x)$

Previous Answer: Vertical compression by 1/2, reflection over the x-axis.

3. Identify the transformation(s) of $g(x)$ compared to $f(x)$.

Parent Function: $f(x) = 2^x$
Transformed Function: $g(x) = 2^{x-3} + 1$

Previous Answer: 1 unit left.

2. Identify the transformation(s) of $g(x)$ compared to $f(x)$.

Previous Answer: 3 units right, up 1

4. Identify the transformation(s) of $g(x)$ compared to $f(x)$.



2 versions + answer key included

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Why do you need this?

Transformations of Exponential Functions Circuit



It's self-checking! Your students will know if they are correct or not.



2 differentiated versions for all students practice this essential math skill.

Name: _____ Date: _____

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS CIRCUIT

Directions: A circuit is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

1 → _____ → _____ → _____ → _____ → _____

| | | | |
|---|---|---|---|
| Previous Answer: Right 4 units, down 2 units. # _____ | 2. Identify the transformation(s) of $g(x)$ compared to $f(x)$. $g(x) = -4 \cdot 2^{x-2}$ | Previous Answer: Reflection over the x-axis, down 1 unit. | 7. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = 2^x$ Transformed Function: $g(x) = \frac{1}{2} \cdot 2^x + 1$ |
| Previous Answer: Right 1 unit, up 8 units. # _____ | 3. Identify the transformation(s) of $g(x)$ compared to $f(x)$. $g(x) = \frac{1}{3} \cdot 5^{-x}$ | Previous Answer: Reflection over y-axis, up 3 units | 8. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = 2^x$ Transformed Function: $g(x) = 2^{-x} - 2$ |
| Previous Answer: Left 2 units, up 5 units. # _____ | 4. Identify the transformation(s) of $g(x)$ compared to $f(x)$. $g(x) = 6 \left(\frac{1}{2}\right)^{x+3}$ | Previous Answer: 2 units left, up 4 units | 9. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = \left(\frac{1}{2}\right)^x$ Transformed Function: $g(x) = \left(\frac{1}{2}\right)^{x+3} - 4$ |

10. Identify the transformation(s) of $g(x)$ compared to $f(x)$.
Parent Function: $f(x) = \left(\frac{1}{2}\right)^x$
Transformed Function: $g(x) = \left(\frac{1}{2}\right)^{x+3} - 4$

Helpful Hints: Use these hints to help you solve the problems.

Parent Functions
 $f(x) = a^x$ or $\left(\frac{1}{a}\right)^x$
 $a > 1$ = growth
 $0 < a < 1$ = decay

Horizontal shifts
 $f(x) = a^{(x-h)}$ = Right h units
 $f(x) = a^{(x+h)}$ = Left h units

Vertical shifts
 $f(x) = a^x + k$ = Up k units
 $f(x) = a^x - k$ = Down k units

Vertical Stretch/Compression

Transformations of Exponential Functions *includes:*

Challenge: Show all your work in the space below.

Given $g(x) = -3 \cdot 2^{x-4} + 5$, which has already undergone three transformations of the parent function $f(x) = 2^x$. Now, apply the following additional transformations to $g(x)$.

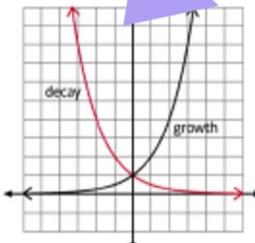
1. Reflect the function over the y-axis
2. Shift the function down 6 units.

Write the new equation after applying these two additional transformations to $g(x)$.

How are you feeling about this topic? Circle one:

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Helpful Hints: Use these hints to help you solve the problems.

| | | |
|--|---|---|
| Parent Functions $f(x) = a^x$ or $(\frac{1}{a})^x$ | Horizontal shifts $f(x) = a^{(x-h)}$ = Right h units $f(x) = a^{(x+h)}$ = Left h units |  |
| $a > 1$ = growth $0 < a < 1$ = decay | Vertical shifts $f(x) = a^x + k$ = Up k units $f(x) = a^x - k$ = Down k units | |
| Horizontal Asymptote at $y = 0$ | Vertical Stretch/Compression $f(x) = c \cdot a^x$ | |
| Reflections $f(x) = -a^x$ = Over x-axis $f(x) = a^{-x}$ = Over y-axis | $c > 1$ = Vertical stretch $0 < c < 1$ = Vertical compression | |

How are you feeling about this topic? Circle one:

✓ 10 self-checking problems

✓ a detailed answer key

✓ a standard version with an extension question

✓ a basic version with helpful hints section

✓ student self assessment

Transformations of Exponential Functions

standards covered:

CCSS: HSF-BF.B.3, HSF-IF.C.7.e

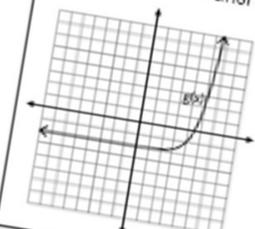
TEKs: A2.2.A

VA SOLs: F.A11.7

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS CIRCUIT

Previous Answer: Reflection over x-axis, vertical compression by $1/2$, left 2 units. # **6**

7. Identify the transformation(s) of:



- Right 4 units
- down 2 units

Previous Answer: Vertical compression by $1/3$, reflection over the y-axis. # **3**

8. Identify the transformation(s) of:
 $g(x) = \left(\frac{1}{3}\right)^{x+2} + 5$

- left 2 units
- up 5 units

Previous Answer: Reflection over the x-axis, up 3 units. # **4**

9. Identify the transformation(s) of:
 $g(x) = 7 \cdot 2^{-x} - 1$

- vertical stretch by 7
- Reflection over y-axis
- down 1

Previous Answer: Left 1 unit, down 4 units. # **2**

10. Identify the transformation(s) of:
 $g(x) = 6^{x-1} + 8$

- Right 1 unit
- up 8 units

Challenge: Show all your work in the space below.

Given $g(x) = -3 \cdot 2^{x-4} + 5$, which has already undergone three transformations of the parent function $f(x) = 2^x$. Now, apply the following additional transformations to $g(x)$.

1. Reflect the function over the y-axis
2. Shift the function down 6 units.

Write the new equation of the function.

how this circuit resource works

Then search for their answer on the worksheet. Once the answer is found, students complete the problem below it.

Students can track their path at the top.

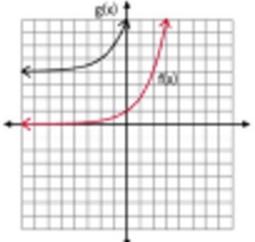
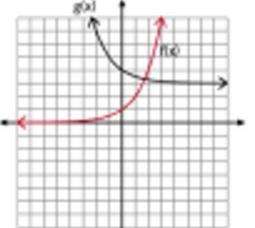


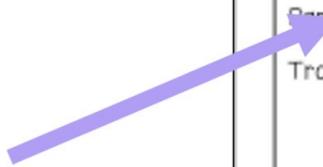
Name: _____ Date: _____

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS CIRCUIT

Directions: A circuit is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

1 → _____ → _____ → _____ → _____ → _____ → _____ → _____ → _____ → 1

| | |
|---|---|
| Previous Answer: Vertical compression by 1/2, up 1 unit. # _____ | Previous Answer: 1 unit left, up 3 units. # _____ |
| 1. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = 2^x$ Transformed Function: $g(x) = 2^{x-3} + 1$ | 2. Identify the transformation(s) of $g(x)$ compared to $f(x)$.  |
| Previous Answer: Vertical compression by 1/2, reflection over the x-axis. # _____ | Previous Answer: 3 units right, up 1 unit. # _____ |
| 3. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = 2^x$ Transformed Function: $g(x) = 3 \cdot 2^x$ | 4. Identify the transformation(s) of $g(x)$ compared to $f(x)$.  |



Students start with the first question.

The last question they answer should lead back to problem #1 to “close” the circuit.

how to use this resource

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS CIRCUIT

| | |
|---|--|
| Previous Answer: Reflection over the x-axis, down 1 unit. # <u>6</u> | Previous Answer: Vertical stretch by 3. # <u>3</u> |
| 7. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = 2^x$ Transformed Function: $g(x) = \frac{1}{2} \cdot 2^x + 1$ • Vertical compression by $\frac{1}{2}$ • up 1 unit | 8. Identify the transformation(s) of $g(x)$ compared to $f(x)$. Parent Function: $f(x) = 2^x$ Transformed Function: $g(x) = 2^{-x} - 2$ • Reflection over the y-axis |

Previous Answer: Reflection over y

9. Identify the transformation(s) compared to $f(x)$.
• left 1 unit
• down 3 units

Helpful Hints: Use these hints

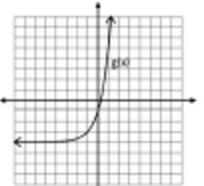
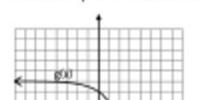
| | |
|--|---------------------------------|
| Parent Functions $f(x) = a^x$ or $(\frac{1}{a})^x$ $a > 1$ = growth $0 < a < 1$ = decay | Horizontal Asymptote at $y = 0$ |
| Reflections $f(x) = -a^x$ = Over x-axis $f(x) = a^{-x}$ = Over y-axis | |

Name: Answer Key Date: _____

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS CIRCUIT

Directions: A circuit is a route that starts and ends at the same place. Start in the first box labeled 1 and solve the problem. Search through the remaining boxes for the answer you got for question 1. Now complete that question. Continue until you have completed the questions and you are back to the original question. Record your path below.

1 → 4 → 9 → 2 → 10 → 3 → 8 → 5 → 6 → 7 → 1

| | |
|---|---|
| Previous Answer: Right 4 units, down 2 units. # <u>7</u> | Previous Answer: Vertical stretch by 7, reflection over the y-axis, down 1 unit. # <u>9</u> |
| 1. Identify the transformation(s) of: $g(x) = -4 \cdot 2^{x-2}$ • Reflection over x-axis • Vertical stretch by 4 • Right 2 units | 2. Identify the transformation(s) of $g(x)$:  • left 1 unit • down 4 units |
| Previous Answer: Right 1 unit, up 8 units. # <u>10</u> | Previous Answer: Reflection over x-axis, vertical stretch by 4, right 2 units. # <u>1</u> |
| 3. Identify the transformation(s) of: $g(x) = \frac{1}{3} \cdot 5^{-x}$ • Vertical compression by $\frac{1}{3}$ • Reflection over the y-axis | 4. Identify the transformation(s) of:  • Reflection over the x-axis • up 3 units |

This is a great activity to use when reviewing identifying transformations of exponential functions.

It can be used right after teaching the concept or as homework.

This is also a **substitute-friendly** assignment!

You may also enjoy...

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS

Algebra 2 Guided Notes

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS

| | | |
|---------------------------------------|------------|----------|
| Graph shifts left. | $f(x + h)$ | $f(x) =$ |
| Graph shifts right. | $f(x - h)$ | $f(x)$ |
| Graph shifts up. | $f(x) + k$ | $f(x)$ |
| Graph shifts down. | $f(x) - k$ | $f(x)$ |
| Flips over the x-axis. | $-f(x)$ | |
| Flips over the y-axis. | $f(-x)$ | |
| Graph stretches away from the y-axis. | $f(ax)$ | |
| Graph shrinks towards the y-axis. | $f(ax)$ | |
| Graph stretches away from the x-axis. | $af(x)$ | |
| Graph shrinks towards the x-axis. | $af(x)$ | |

TRANSFORMATIONS OF EXPONENTIAL FUNCTIONS

Steps for Graphing Transformations of Exponential Functions

- Step 1: Identify the parent function and
- Step 2: Identify the transformations of the given
- Step 3: Create a table of values.
- Step 4: Plot the points on the graph and connect them

Directions: Graph each exponential function and identify the characteristics.

1. $g(x) = 4^x - 3$ Parent Function: $y = 4^x$

| | | | | | |
|---|--------------------|-------------------|----|---|----|
| x | -2 | -1 | 0 | 1 | 2 |
| y | $\frac{1}{16} - 3$ | $\frac{1}{4} - 3$ | -2 | 1 | 13 |

Y-Intercept: $(0, -2)$ Asymptote: $y = -3$

Growth or Decay? **Vertical translation down**

Transformation(s): **Vertical translation down 3 units**

Domain: $x \in \mathbb{R}$

Range: $y > -3$

End Behavior: $x \rightarrow -\infty, f(x) \rightarrow -3$

End Behavior: $x \rightarrow \infty, f(x) \rightarrow \infty$

Identify each characteristic of the graph.

Math with Ms. Rivera

Answer key included

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CHARACTERISTICS OF EXPONENTIAL FUNCTIONS

Football Task Cards

CHARACTERISTICS OF EXPONENTIAL TASK CARDS

Directions: Identify the key characteristics of each graph in the booklet.

Name: **ANSWER KEY** Date: _____

G Domain: $(-\infty, \infty)$ Range: $(-5, \infty)$ Circle one: Growth or Decay: $y = 5$ Y-Intercept: $(0, -4)$ End Behavior: $x \rightarrow -\infty, f(x) \rightarrow -5$ $x \rightarrow \infty, f(x) \rightarrow \infty$

H Domain: $(-\infty, \infty)$ Range: $(-5, \infty)$ Circle one: Growth or Decay: $y = -5$ Y-Intercept: $(0, -4)$ End Behavior: $x \rightarrow -\infty, f(x) \rightarrow -5$ $x \rightarrow \infty, f(x) \rightarrow \infty$

I Domain: $(-\infty, \infty)$ Range: $(4, \infty)$ Circle one: Growth or Decay: $y = 4$ Y-Intercept: $(0, 4.5)$ End Behavior: $x \rightarrow -\infty, f(x) \rightarrow 4$ $x \rightarrow \infty, f(x) \rightarrow \infty$

J Domain: $(-\infty, \infty)$ Range: $(-\infty, 2)$ Circle one: Growth or Decay: $y = 2$ Y-Intercept: $(0, -7)$ End Behavior: $x \rightarrow -\infty, f(x) \rightarrow 2$ $x \rightarrow \infty, f(x) \rightarrow -\infty$

Identify each characteristic of the graph.

Math with Ms. Rivera

Recording sheet & Answer key included

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GRAPHING EXPONENTIAL FUNCTIONS

"S'MITTEN ABOUT MATH!"

S'MITTEN ABOUT MATH!

Student work bulletin board

Math with Ms. Rivera

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Free Algebra Activities!

When you join my email list, I'll send you a free Algebra print & digital self-checking activities. There is an Algebra 1 and Algebra 2 version!

You'll also be getting exclusive freebies and content to help your Algebra students be successful this school year!

check it out!

The image shows a collage of algebra worksheets and a digital tablet. The worksheets include:

- Answer Key** for **ADDING & SUBTRACTING RATIONAL EXPRESSIONS** and **SOLVING SYSTEMS OF EQUATIONS**.
- Worksheets for **MULTIPLYING & DIVIDING RATIONAL EXPRESSIONS** and **SOLVING SYSTEMS OF EQUATIONS**.

The digital tablet displays a self-checking activity titled **Rational Expression Operations - Addition & Subtraction**. The directions are: "Answer each question and type the question number with the matching answer in the answer column to the right." The activity consists of a grid of questions and answers, with a path highlighted in blue and yellow.

| # | Question | Answer | Type the matching question numbers here |
|---|--|-----------------------------|---|
| 1 | $\frac{5}{x} + \frac{3}{x+1}$ | $\frac{2x+1}{x+2}$ | |
| 2 | $\frac{2}{x+4} - \frac{x^2}{x^2-16}$ | $-\frac{1}{x^2-1}$ | |
| 3 | $\frac{x+2}{x^2+4x+4} + \frac{2x}{x+2}$ | $\frac{2x^2+2x+5}{x^2+x-2}$ | |
| 4 | $\frac{x}{x-2} + \frac{3}{x-1}$ | $\frac{-x^2+2x-8}{x^2-16}$ | |
| 5 | $\frac{x}{4x+8} - \frac{1}{x^2+2x}$ | $\frac{8x+5}{x^2+1}$ | |
| 6 | $\frac{x+2}{x-1} + \frac{x-1}{x+2}$ | $\frac{x^2-3x+7}{x^2-4}$ | |
| 7 | $\frac{2x+1}{x^2-4} + \frac{x-3}{x+2}$ | $\frac{x^2+2x-6}{x^2-3x+2}$ | |
| 8 | $\frac{x^2+2x}{x^2-1} - \frac{x+1}{x-1}$ | $\frac{x-2}{4x}$ | |

(c) Malia Rivera, 2024



hey there!

My name is Malia and I'm passionate about making learning and practicing math fun. I love creating engaging math resources for my students and I hope your students enjoy this activity too!

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