

keep scrolling to  
get a sneak peek!

Help your Algebra students  
practice applying linear,  
quadratic, and exponential  
regression given a set of data.  
Students will be eager to get  
the self-checking benefits from  
this circuit activity!

# LINEAR, QUADRATIC, & EXPONENTIAL REGRESSION

## Differentiated Circuit worksheet

AR, QUADRATIC, & EXPONENTIAL REGRESSION

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

1 → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_ → \_\_\_\_\_

Previous Answer:  $y = -4x.78x + 56.52$  # \_\_\_\_\_

2. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

x	-3	-2
y	40	20

Circle one: Linear    Quadratic    Exponential

Equation: \_\_\_\_\_

Previous Answer:  $y = -0.89x^2 + 0.15x - 5.03$  # **9**

2. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

x	0	1
y	50	38

Circle one: Linear    Quadratic    Exponential

Equation:  $y = 1.23x^2 - 1.64x + 5.75$

Previous Answer:  $y = 7.7x - 1.4$  # **10**

3. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

Previous Answer:  $y = (47.67)^x$



2 versions + answer key included

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Why do you need this?

# Linear, Quadratic, Exponential Regression 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: \_\_\_\_\_

## WRITING QUADRATIC EQUATIONS IN VERTEX FORM 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: $y = 2(x + 3)^2 - 2$ # _____	Previous Answer: _____
1. Write a quadratic equation in vertex form that goes through the point (3, 12) and has a vertex of (1, 4).	2. Write a quadratic equation in vertex form that goes through the point (5, 8) and has a vertex of (3, 4).
Previous Answer: $y = -4/3(x - 5)^2 + 3$ # _____	Previous Answer: _____
3. Write a quadratic equation in vertex form that goes through the point (2, 2) and has a vertex of (0, 6).	4. Write a quadratic equation in vertex form that goes through the point (5, 8) and has a vertex of (3, 4).
Previous Answer: $y = (x + 1)^2 + 4$ # _____	Previous Answer: _____
5. Write a quadratic equation in vertex form that goes through the point (-1, 6) and has a vertex of (-3, -2).	6. Write a quadratic equation in vertex form that goes through the point (2, -4) and has a vertex of (1, -6).
Previous Answer: $y = x^2 - 7$ # _____	Previous Answer: $y = (x - 2)^2 + 3$ # _____
7. Write a quadratic equation in vertex form that goes through the point (-3, -2) and has a vertex of (-5, 2).	8. Write a quadratic equation in vertex form that goes through the point (5, 8) and has a vertex of (3, 4).
Previous Answer: $y = (x - 4)^2 - 3$ # _____	Previous Answer: $y = (x + 3)^2 - 3$ # _____
9. Write a quadratic equation in vertex form that goes through the point (2, -4) and has a vertex of (1, -6).	10. Write a quadratic equation in vertex form that goes through the point (2, -4) and has a vertex of (0, -7).

**Toolbox:** Use these tools to help you solve the problems.

**Vertex Form:**  $y = a(x - h)^2 + k$   
Vertex: (h, k)

**Helpful steps:**

- 1) Substitute the given points into the equation.
- 2) Use the addition-subtraction method to solve for a.
- 3) Write the final equation using the given vertex and a.

# Linear, Quadratic, Exponential Regression *includes:*

Challenge: Given data below, determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit. Then use your equation to extrapolate the data at  $x = -3$ .

$(-4, 100), (-2, 62), (-1, 55), (1, 26), (2, 16), (3, 10)$

How are you feeling about this topic? Circle one:

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Helpful steps:

- 1) Add the data into a table: STAT → EDIT
- 2) Determine if the data would best fit a linear, quadratic, or exponential regression model.
- 3) Perform the regression to find the equation: STAT → EDIT → CALC
  - 1) for linear regression, press 4
  - 2) for quadratic regression, press 5
  - 3) for exponential regression, press 0

How are you feeling about this topic? Circle one:

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✓ 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

# Linear, Quadratic, Exponential Regression

standards covered:

**CCSS:** HSF-LE.A.1, HSF-LE.A.2,  
HSS-ID.B.6a, HSS-ID.B.6c

**TEKs:** A.8.B, A.9.E, A2.B, A2.C

**VA SOLs:** S.A.9, S.All.9

**LINEAR, QUADRATIC, & EXPONENTIAL REGRESSION CIRCUIT**

Previous Answer:  $y = 2.64x^2 - 4.53x + 1.09$  # **2**

7. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.  
(-3, 15), (-1, 30), (0, 25), (2, 8), (3, 6), (5, 5)

Circle one: Linear    Quadratic    **Exponential**

Equation:  $y = (14.53) \cdot (0.81)^x$

Previous Answer:  $y = 10.58x^2 - 18.85x + 3.31$  # **5**

8. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.  
(-5, 30), (-1, 10), (1, 8), (3, 18), (4, 40), (6, 70)

Circle one: Linear    **Quadratic**    Exponential

Equation:  $y = 1.42x^2 + 2x + 5.79$

Previous Answer:  $y = -17.41x + 9.31$  # **4**

9. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

x	-3	-1	0	1	2	5
y	150	30	10	15	25	90

Circle one: **Linear**    Quadratic    Exponential

Equation:  $y = -4x.78x + 56.52$

Previous Answer:  $y = (14.53) \cdot (0.81)^x$  # **7**

10. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.  
(-4, 300), (-2, 80), (-1, 50), (0, 30), (2, 20), (3, 10), (4, 5)

Circle one: Linear    Quadratic    **Exponential**

Equation:  $y = (36.82) \cdot (0.63)^x$

Challenge: Given data below, determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit. Then use your equation to extrapolate the data at  $x = -3$ .  
(-4, 100), (-2, 62), (-1, 55), (1, 26), (4, 16), (8, 10)

# 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.

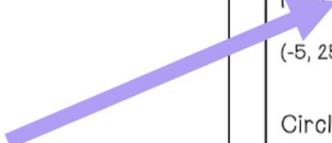
Name: \_\_\_\_\_ Date: \_\_\_\_\_

## LINEAR, QUADRATIC, & EXPONENTIAL REGRESSION 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

<p>Previous Answer: <math>y = -4x.78x + 56.52</math> # _____</p> <p>1. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.</p> <p>(-5, 25), (-4, 16), (-3, 5), (-2, 0), (0, -2), (1, 3), (3, 10), (4, 20)</p> <p>Circle one: Linear    Quadratic    Exponential</p> <p>Equation: _____</p>	<p>Previous Answer: <math>y = 1.20x^2 + 0.71x - 1.86</math> # _____</p> <p>2. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.</p> <table border="1"> <tbody> <tr> <td>x</td> <td>-3</td> <td>-2</td> <td>-1</td> <td>0</td> <td>1</td> <td>3</td> </tr> <tr> <td>y</td> <td>40</td> <td>20</td> <td>5</td> <td>1</td> <td>3</td> <td>10</td> </tr> </tbody> </table> <p>Circle one: Linear    Quadratic    Exponential</p> <p>Equation: _____</p>	x	-3	-2	-1	0	1	3	y	40	20	5	1	3	10
x	-3	-2	-1	0	1	3									
y	40	20	5	1	3	10									
<p>Previous Answer: <math>y = (36.82) \cdot (0.63)^x</math> # _____</p> <p>3. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.</p> <p>(-6, 50), (-5, 45), (-3, 30), (-2, 20), (1, 5), (2, 12), (3, 25)</p> <p>Circle one: Linear    Quadratic    Exponential</p> <p>Equation: _____</p>	<p>Previous Answer: <math>y = (70.27) \cdot (0.76)^x</math> # _____</p> <p>4. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.</p> <p>(-4, 80), (-3, 60), (-1, 20), (0, 5), (1, 15), (2, -30), (3, -50)</p> <p>Circle one: Linear    Quadratic    Exponential</p> <p>Equation: _____</p>														



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

This is a great activity to use when reviewing how to perform linear, quadratic, and exponential regression.

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

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

Name: **Answer Key** Date: \_\_\_\_\_

## LINEAR, QUADRATIC, & EXPONENTIAL REGRESSION 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 → **2** → **7** → **10** → **3** → **5** → **8** → **6** → **4** → **9** → 1

Previous Answer: $y = -4x.78x + 56.52$ # <b>9</b>	Previous Answer: $y = 1.20x^2 + 0.71x - 1.86$ # <b>1</b>
---	--

1. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the curve of best fit.

$(-5, 25), (-4, 16), (-3, 5), (-2, 0), (0, -2)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = 1.20x^2 + 0.71x - 1.86$

Previous Answer:  $y = (36.82)^x$

2. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

$(-3, 15), (-1, 30), (0, 25), (2, 8), (3, 6), (5, 5)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = (14.53)^x(0.81)^x$

Previous Answer:  $y = -17.41x + 9.31$  # **4**

3. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

$(-6, 50), (-5, 45), (-3, 30), (-2, 20), (1, 10)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = 0.97x^2 - 1.02x + 1.02$

Previous Answer:  $y = 0.97x^2 - 1.02x + 1.02$

4. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

x	-3	-1	0	1	2	5
y	150	30	10	15	25	90

Circle one: Linear  Quadratic  Exponential

Equation:  $y = -4x.78x + 56.52$

Previous Answer:  $y = -17.41x + 9.31$  # **4**

5. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

x	-4	-3	-2	0
y	300	100	60	1

Circle one: Linear  Quadratic  Exponential

Equation:  $y = (36.82)^x(0.63)^x$

Previous Answer:  $y = (14.53)^x(0.81)^x$  # **7**

6. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

$(-4, 300), (-2, 80), (-1, 50), (0, 30), (2, 20), (3, 10), (4, 5)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = (36.82)^x(0.63)^x$

Previous Answer:  $y = 10.58x^2 - 18.85x + 3.31$  # **5**

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$(-3, 15), (-1, 30), (0, 25), (2, 8), (3, 6), (5, 5)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = (14.53)^x(0.81)^x$

Previous Answer:  $y = 2.64x^2 - 4.53x + 1.09$  # **2**

8. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

$(-5, 30), (-1, 10), (1, 8), (3, 18), (4, 40), (6, 70)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = 1.42x^2 + 2x + 5.79$

Previous Answer:  $y = 10.58x^2 - 18.85x + 3.31$  # **5**

9. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

$(-4, 300), (-2, 80), (-1, 50), (0, 30), (2, 20), (3, 10), (4, 5)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = (36.82)^x(0.63)^x$

Previous Answer:  $y = (14.53)^x(0.81)^x$  # **7**

10. Determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

$(-4, 300), (-2, 80), (-1, 50), (0, 30), (2, 20), (3, 10), (4, 5)$

Circle one: Linear  Quadratic  Exponential

Equation:  $y = (36.82)^x(0.63)^x$

Previous Answer:  $y = (14.53)^x(0.81)^x$  # **7**

**Challenge:** Given data below, determine whether the data set is best represented by a linear, quadratic, or exponential regression, and find the equation of the curve of best fit.

You may also enjoy ...

# LINEAR REGRESSION

## Algebra 2 Guided Notes

**LINEAR REGRESSION**

Scatter Plot Definition: A graph of between points that show the relationship between two sets of data.

Scatter Plot Relationships: positive correlation, negative correlation, no correlation.

Line of Best Fit Definition: A line that lies as close as possible to all the data points.

Linear Regression Definition: A linear model that is used to describe the relationship between two variables.

Linear Interpolation: Estimating data on an existing set of values.

Graphing Calculator Steps for Linear Regression: Step 1: Create a data table. STAT > EDIT. Step 2: Run the linear regression. STAT > CALC > 4: LinReg. Step 3: Write down the linear regression equation in the form  $y = ax + b$ .

Example: Emma recently purchased a new car. She decided to keep track of how many miles she drove on her 6 business trips. The results are shown in the table below.

Miles Driven	Number of Gallons Used
150	7
200	
300	
400	
500	
600	

Using your graphing calculator, perform linear regression to find the best fit. Round all values to the nearest hundredths.

Equation:  $y = 0.053x - 0.47$

How many gallons are used for 3000 miles of extrapolated travel?  
 $y = 0.053(3000) - 0.47$   
 $y = 152.8 - 0.47$   
 $y = 152.3$  (gallons used)

Math with Ms. Rivera

Answer key included

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# LINEAR REGRESSION

## GRAPHING CALC STEPS

### Bookmark/cheat sheet

**GRAPHING CALCULATOR CHEAT SHEET FOR LINEAR REGRESSION**

**Making a Scatter Plot**

- 1) STAT → Edit and enter lists into L<sub>1</sub> and L<sub>2</sub>
- 2) 2nd → Y= (STAT Plot), Turn Plot I ON  
Xlist = L<sub>1</sub>  
Ylist = L<sub>2</sub>
- 3) ZOOM → 9 to display scatter plot

**Performing Linear Regression**

- 1) STAT → CALC → 4: LinReg (ax + b)
- 2) Enter, Enter

Math with Ms. Rivera

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# QUADRATIC REGRESSION

## Algebra 2 Guided Notes

**QUADRATIC REGRESSION**

Calculator Quadratic Regression: Step 1: Create a table of values. STAT > EDIT. Step 2: Run the quadratic regression. STAT > CALC > 5: QuadReg. Step 3: Write down the quadratic regression equation in  $y = ax^2 + bx + c$ .

Graphing Calculator Steps for Quadratic Regression: Step 1: Create a table of values. STAT > EDIT. Step 2: Run the quadratic regression. STAT > CALC > 5: QuadReg. Step 3: Write down the quadratic regression equation in the form  $y = ax^2 + bx + c$ .

Table below shows the fuel efficiencies of a vehicle at different speeds. Write a function that models the data. Use the model to approximate the optimal driving speed. Round to the nearest hundredths place, if necessary.

Miles per hour	20	25	30	36	40	45	50	56	60
Miles per gallon	14.5	17.5	21.2	23.7	25.2	25.8	25.1	24.1	21.8

Quadratic Regression Model:  $y = -0.01x^2 + 1.37x - 7.14$

Table below shows Gustavo's science project data. Write a function that models the data. Use the model to approximate the optimal driving speed. Round to the nearest thousandths place, if necessary.

Time (Hours)	3	4	5	6	7	8
Speed (ft/min)	23.3	37.9	36.6	32.7	32.8	29.1

Quadratic Regression Model:  $y = -0.01x^2 + 1.37x - 7.14$

Math with Ms. Rivera

Answer key included

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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**.
- MULTIPLYING & DIVIDING RATIONAL EXPRESSIONS** worksheet with problems like  $\frac{x-2}{x^2+2x+1}$ .
- SOLVING SYSTEMS OF EQUATIONS** worksheet with problems like  $2. 2x - 6y = -18$  and  $x = 3y - 4$ .

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 table with 8 questions and 8 answers, with a path of colored lines connecting the questions to their corresponding answers.

#	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	$\frac{x^2+2x}{x^2-1} - \frac{x+1}{x-1}$	$\frac{x-2}{4x}$	

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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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