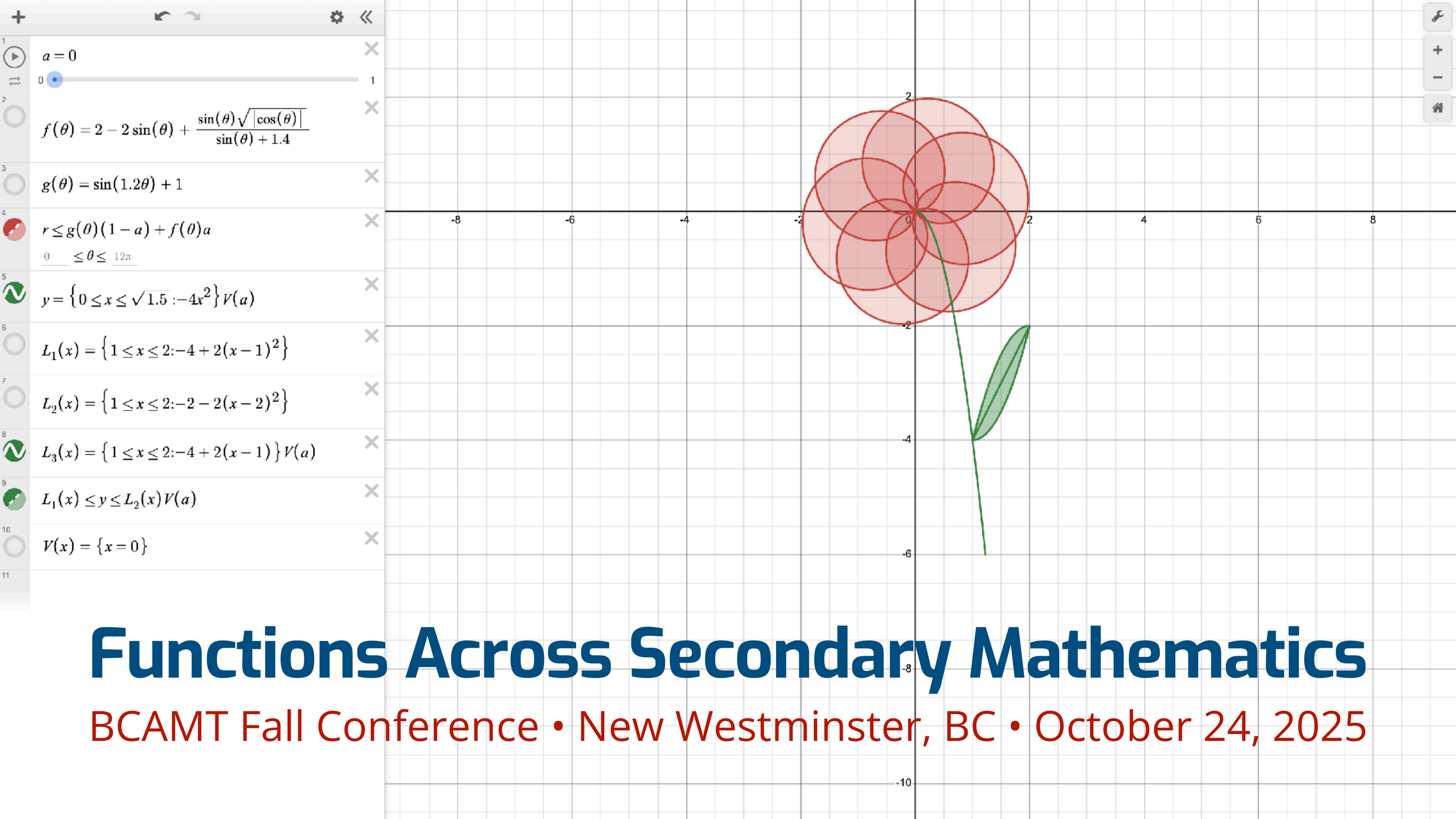

Functions Across Secondary Mathematics

BCAMT Fall Conference • New Westminster, BC • October 24, 2025

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BCAMT

British Columbia Association of Mathematics Teachers

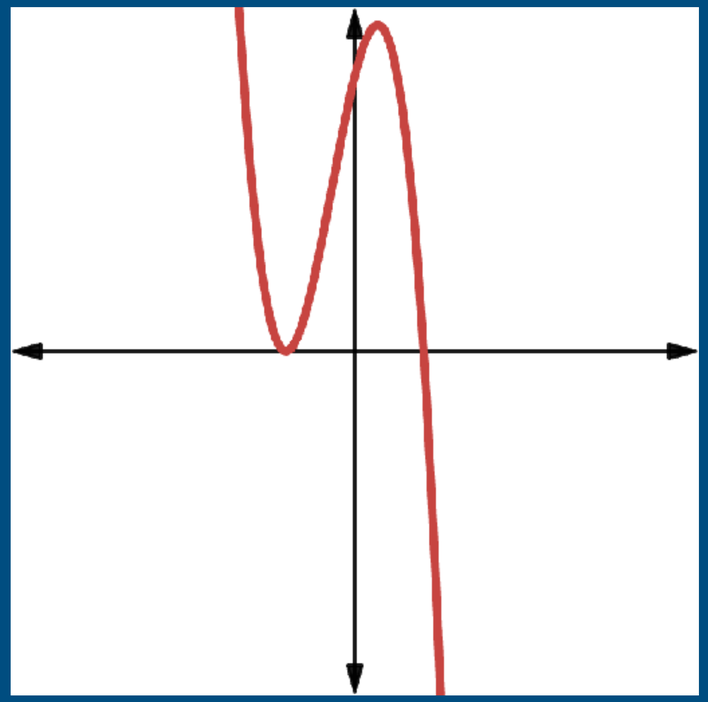
Which One Doesn’t Belong?

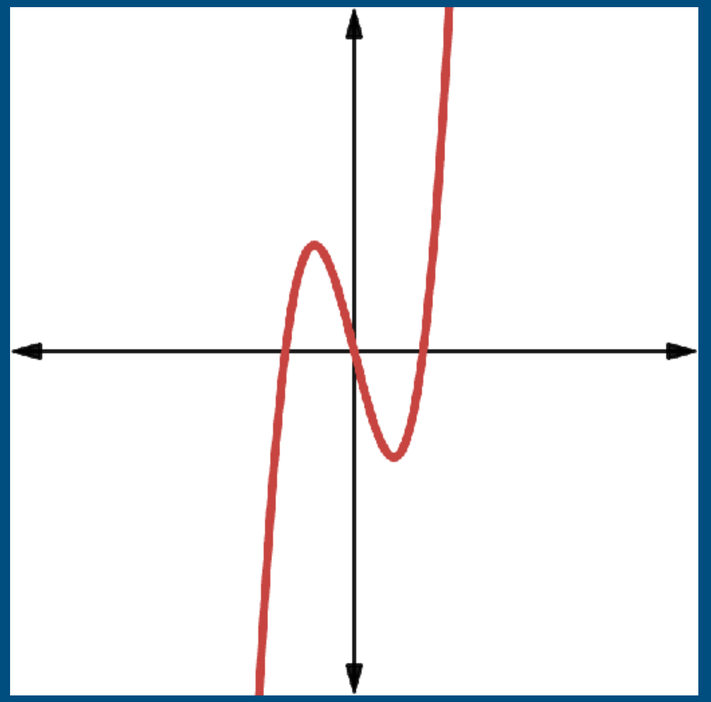
____ does not belong because…

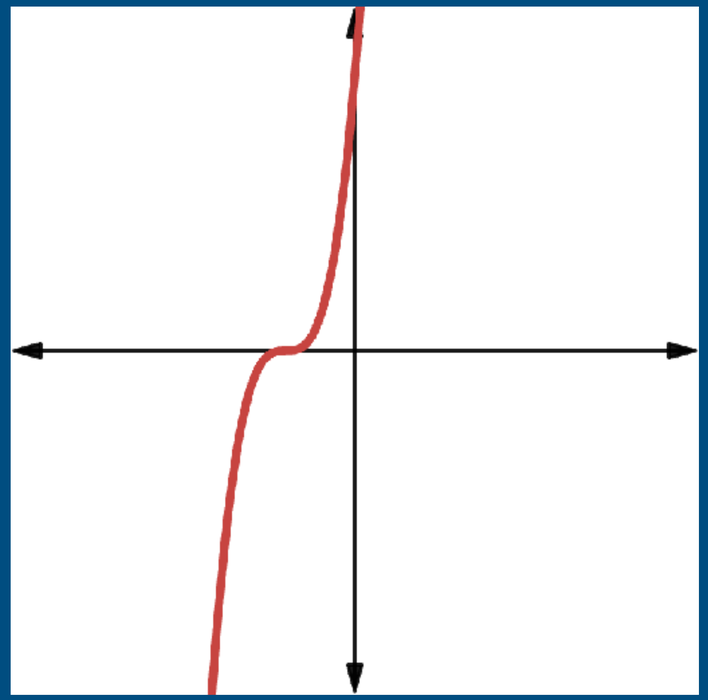
What makes ____ different from the others is…

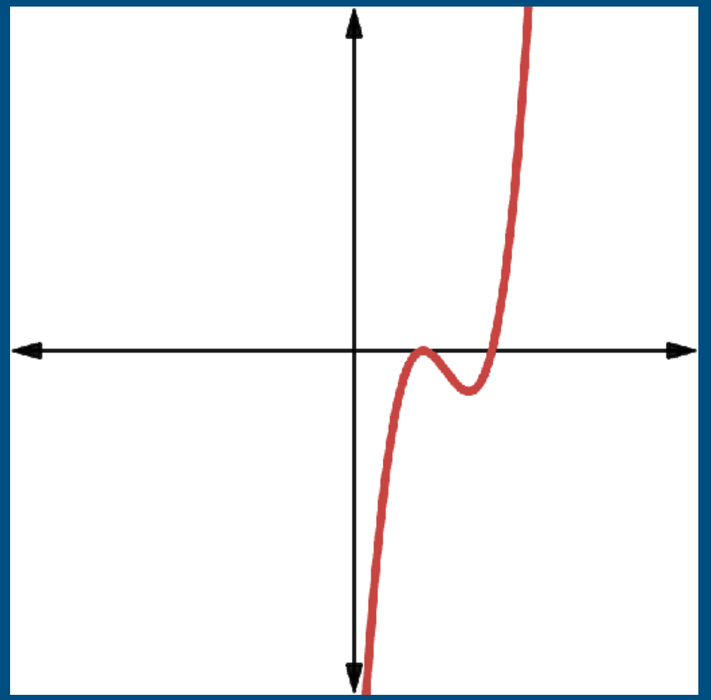
Only ____ has ____

All ____ have ____ except ____









10

functions and relations

linear functions

10

functions and relations

linear functions

11

quadratic functions

10

functions and relations

linear functions

11

quadratic functions

12

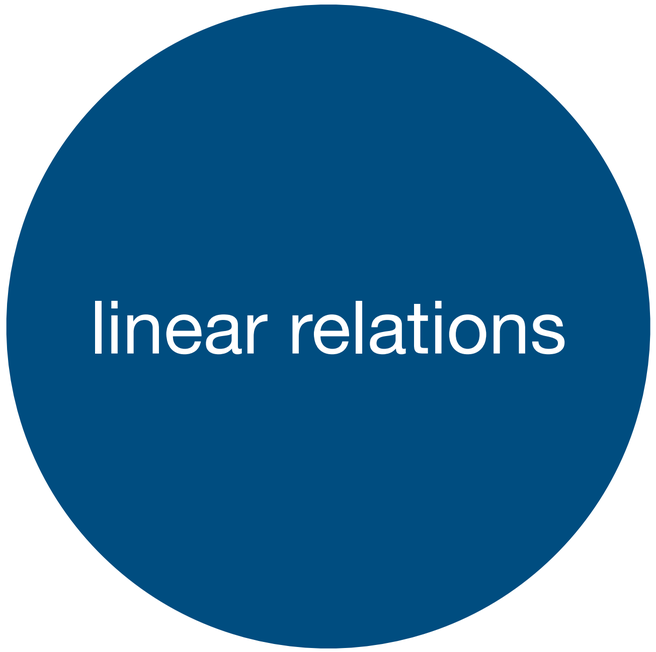
transformations

exponential, logarithmic, polynomial, rational, and trigonometric functions

6

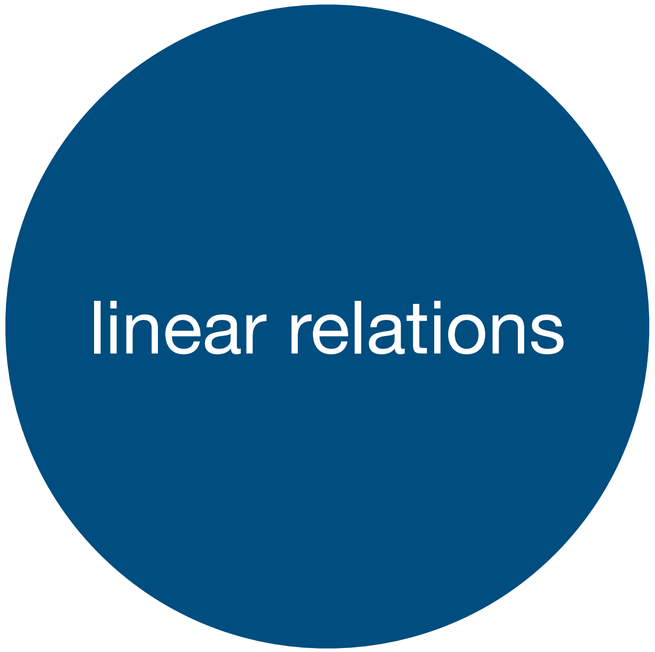
functional relationships
expressions, graphs, tables

7



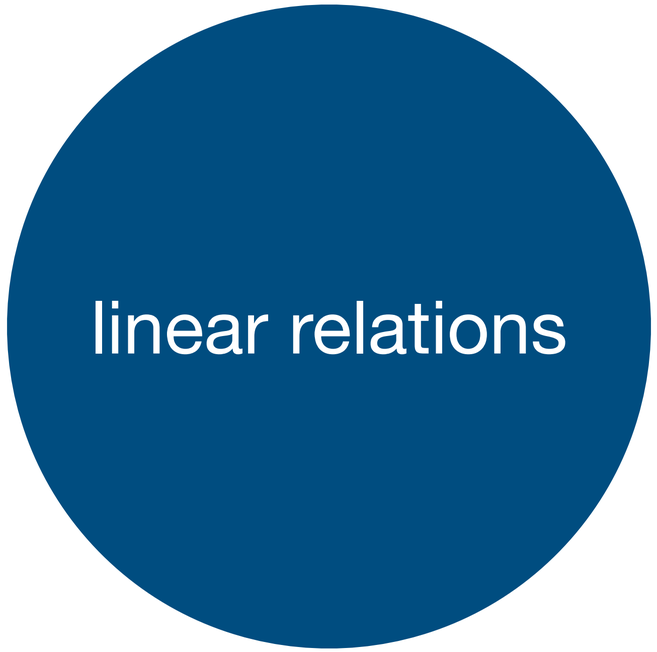
integral coordinates

8



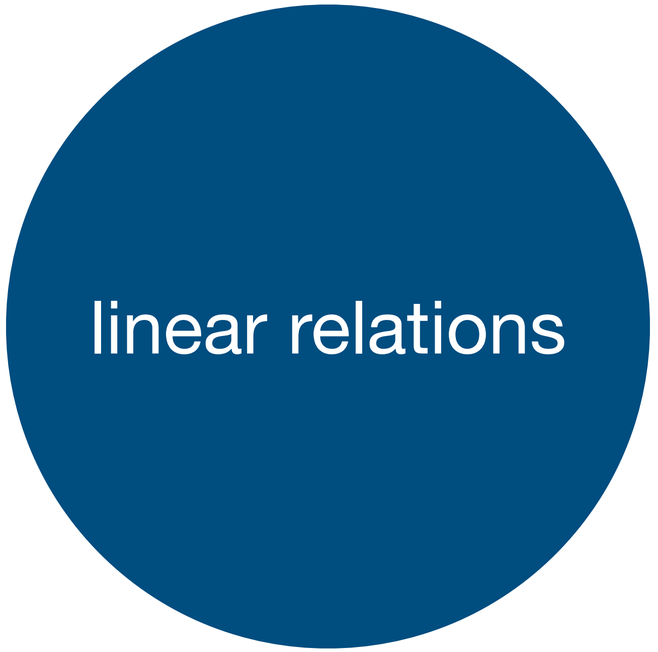
(larger) integral coordinates
equations, graphs, tables

8



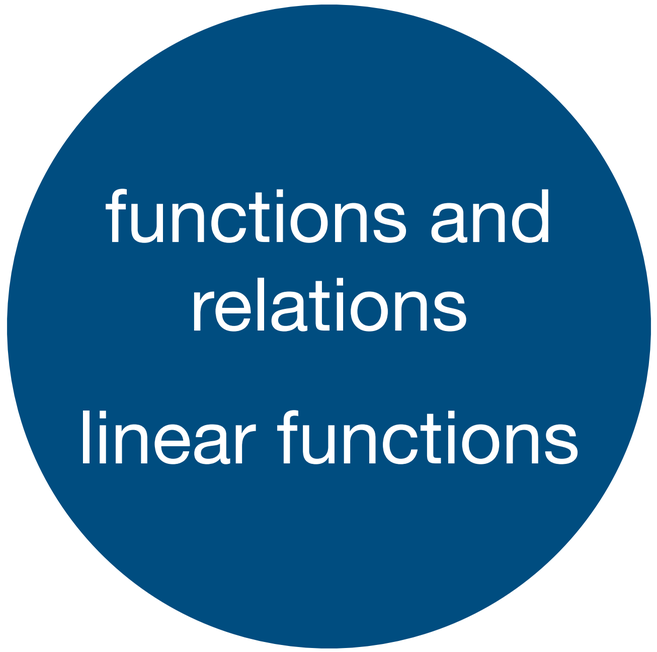
(larger) integral coordinates
equations, graphs, tables

9

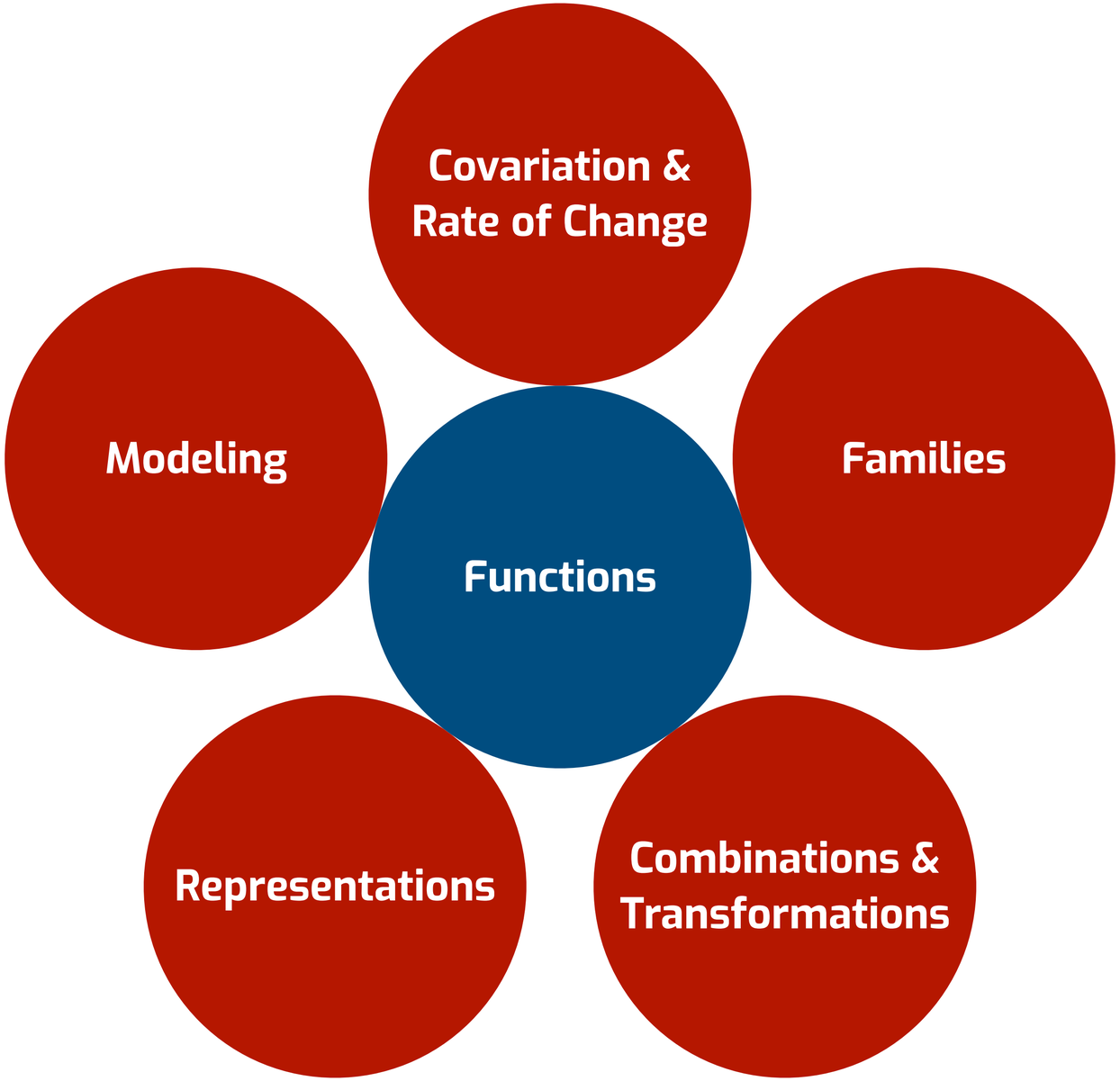


continuous
rational coordinates

10

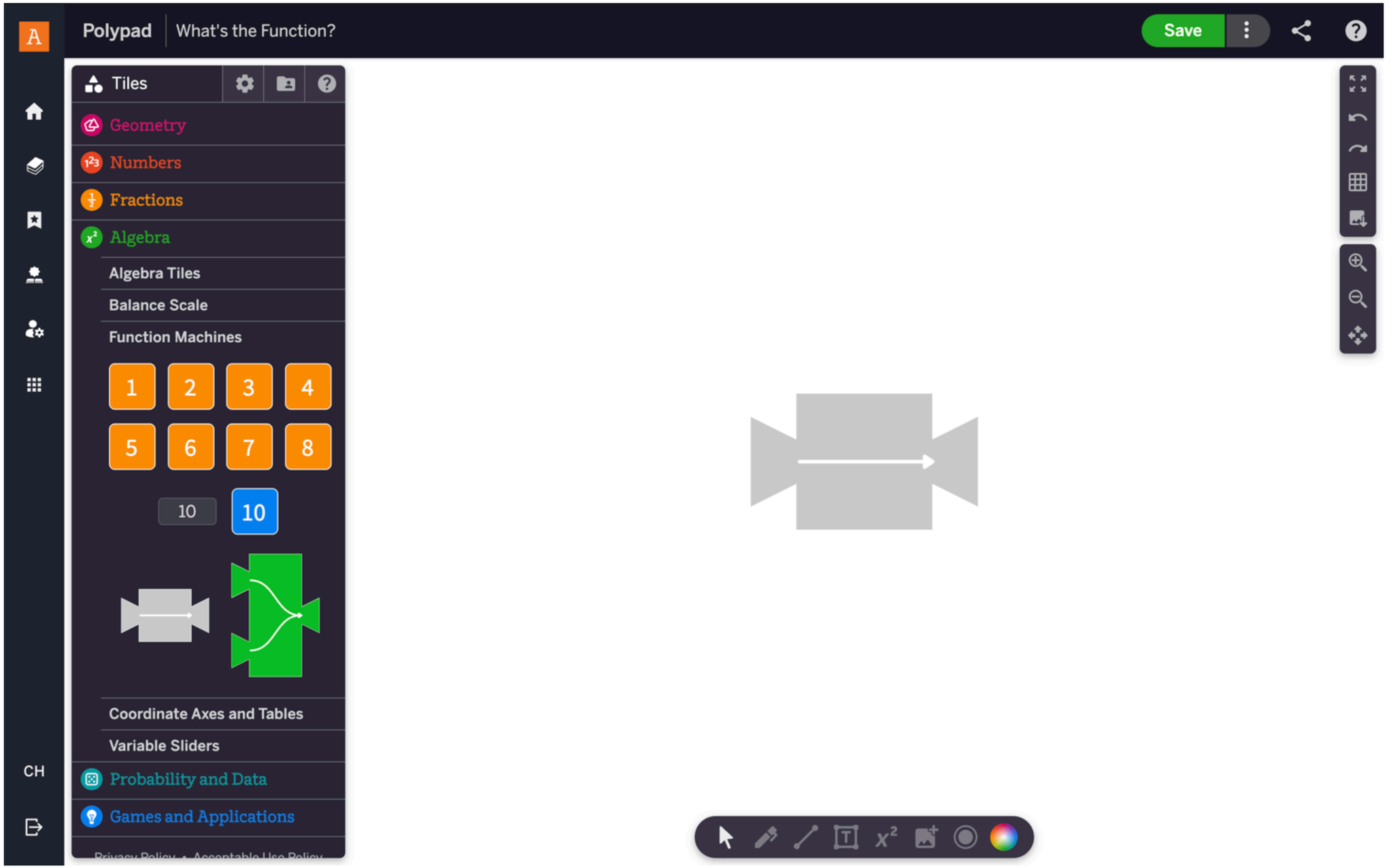


slope
equations of lines


Covariation &
Rate of Change
Modeling
Families
Functions
Representations
Combinations &
Transformations

Functions

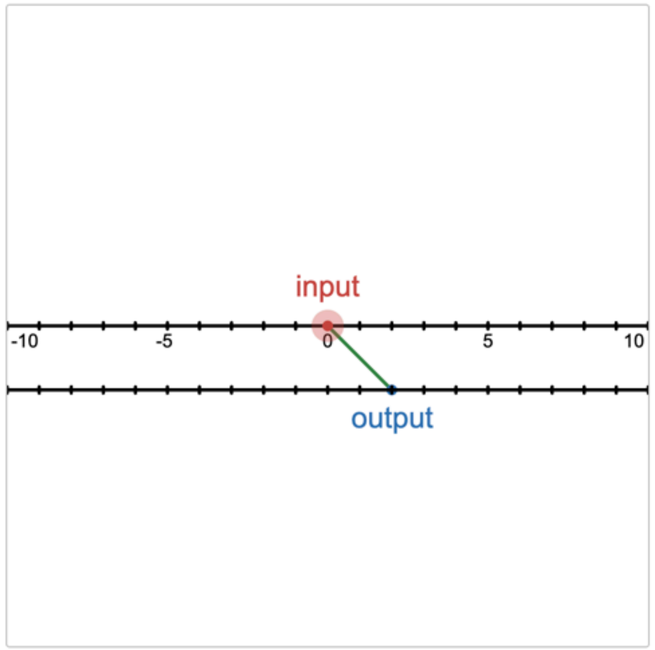
How do quantities relate to each other?


Polypad
What's the Function?
Save
Tiles
Geometry
Numbers
Fractions
Algebra
Algebra Tiles
Balance Scale
Function Machines
1
2
3
4
5
6
7
8
10
10
Coordinate Axes and Tables
Variable Sliders
Probability and Data
Games and Applications
CH

Covariation & Rate of Change

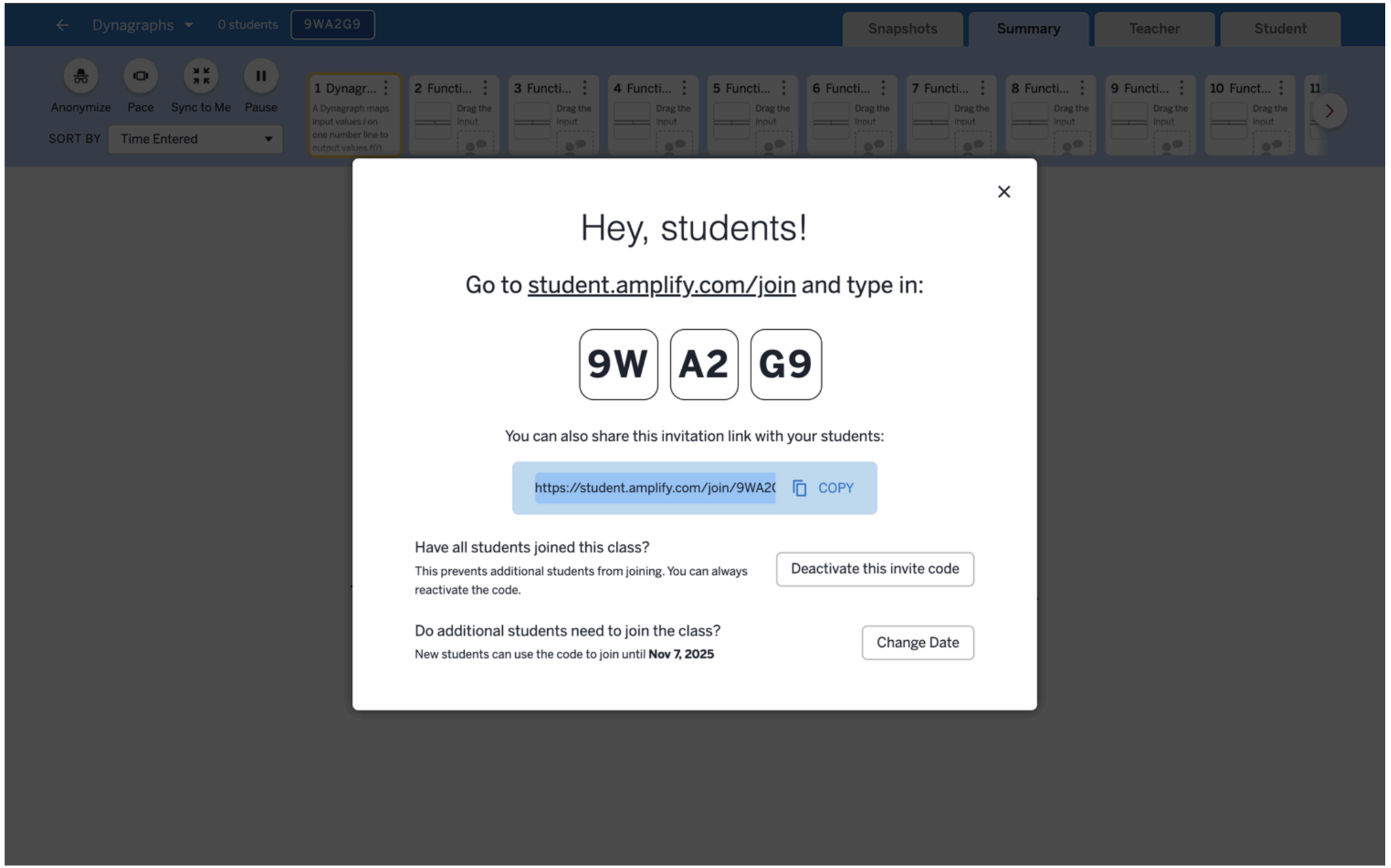
How do quantities change together?

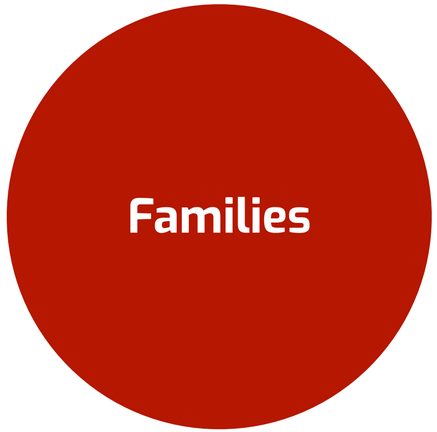
Function #1



Drag the input point to explore the input and output values visually and numerically. What is the function *f*? How do you know?

Share With Class


Dynagraphs
0 students
9WA2G9
Snapshots
Summary
Teacher
Student
Anonymize
Pace
Sync to Me
Pause
SORT BY
Time Entered
1 Dynagr...
2 Functi...
3 Functi...
4 Functi...
5 Functi...
6 Functi...
7 Functi...
8 Functi...
9 Functi...
10 Funct...
Drag the input
Hey, students!
Go to student.amplify.com/join and type in:
9W
A2
G9
You can also share this invitation link with your students:
https://student.amplify.com/join/9WA2
COPY
Have all students joined this class?
This prevents additional students from joining. You can always reactivate the code.
Deactivate this invite code
Do additional students need to join the class?
New students can use the code to join until Nov 7, 2025
Change Date


Families

What are the important characteristics of … ?

WANTED

QUADRATIC FUNCTION (A.K.A. "PARABOLA")...

... OPENS UP

... POSITIVE Y-INTERCEPT

... NO X-INTERCEPTS

... NEVER ENTERS QIII

... VERTEX IN QII

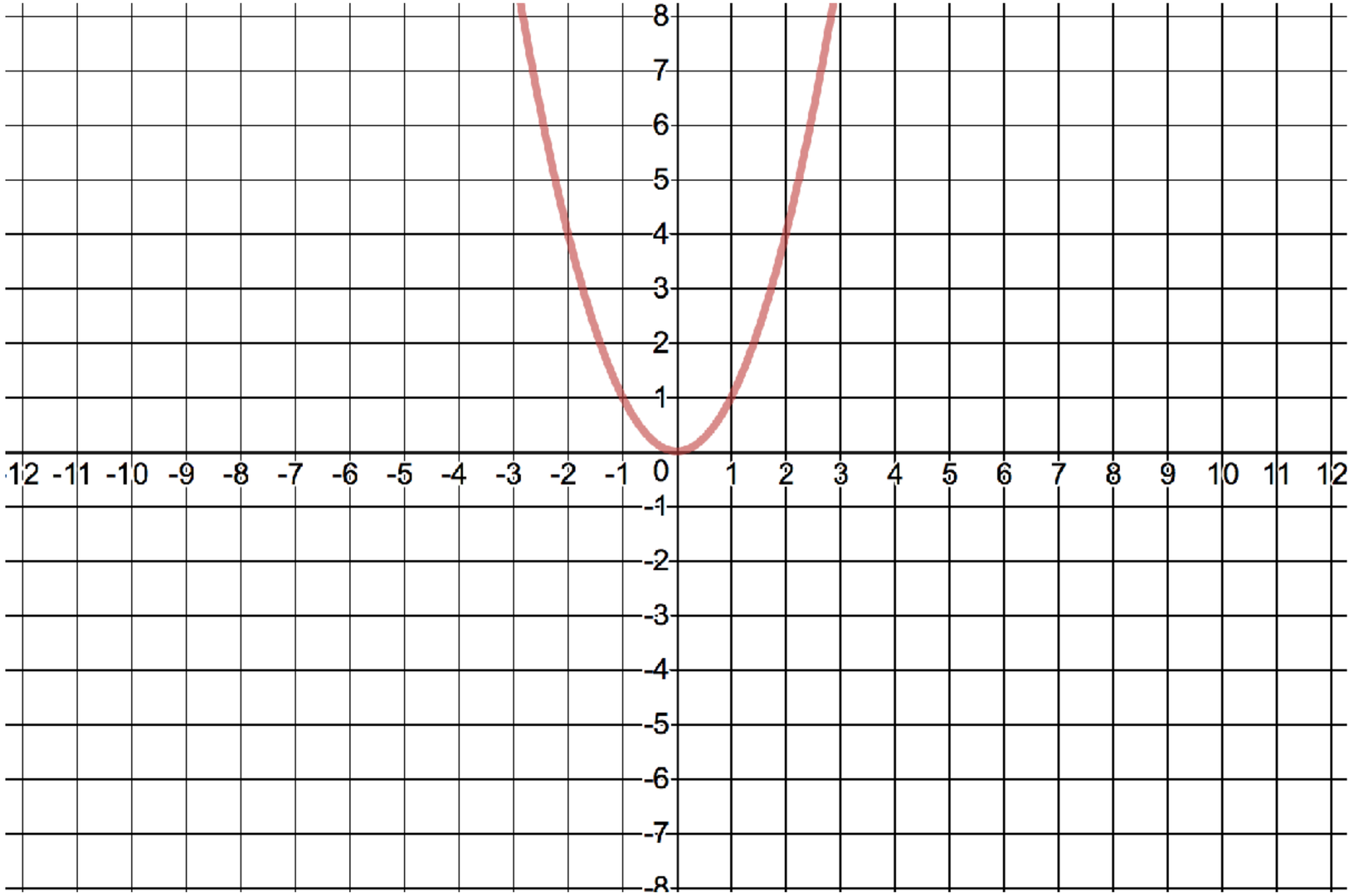
... MINIMUM VALUE OF 3

... AXIS OF SYMMETRY X = -5

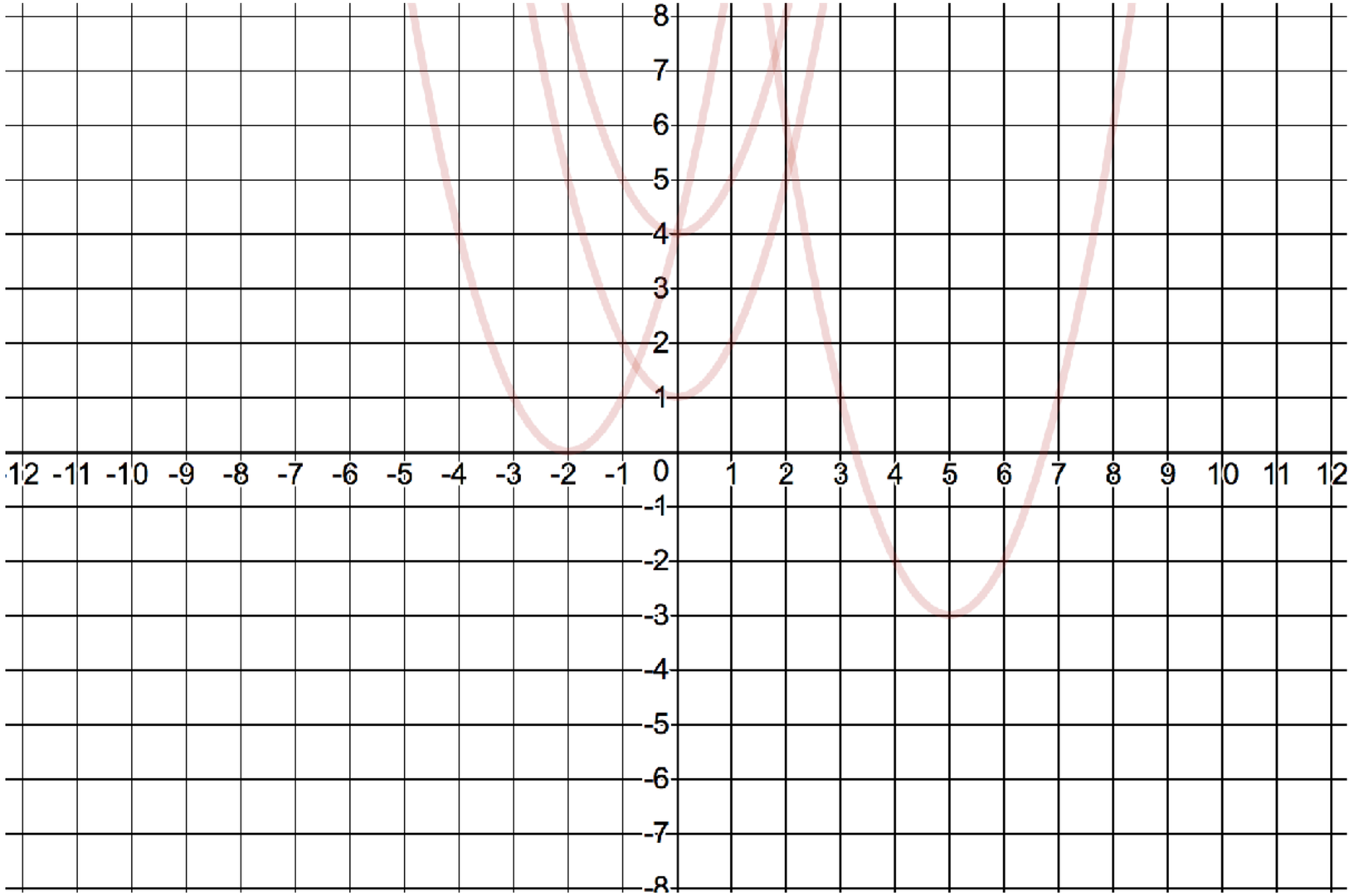
... VERTICALLY STRETCHED

... PASSES THROUGH (-7, 15)

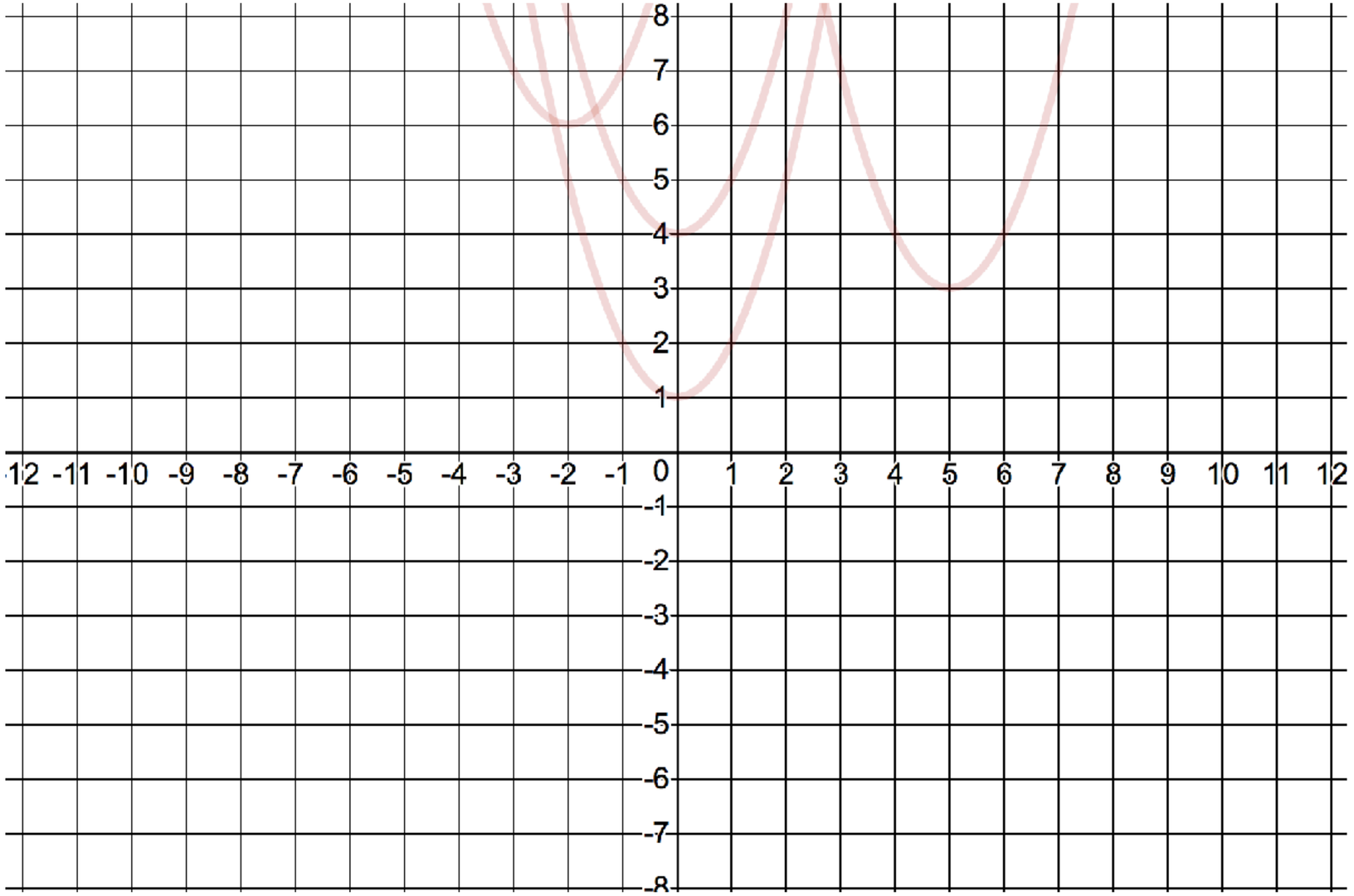
... VERTEX (-5, 3)



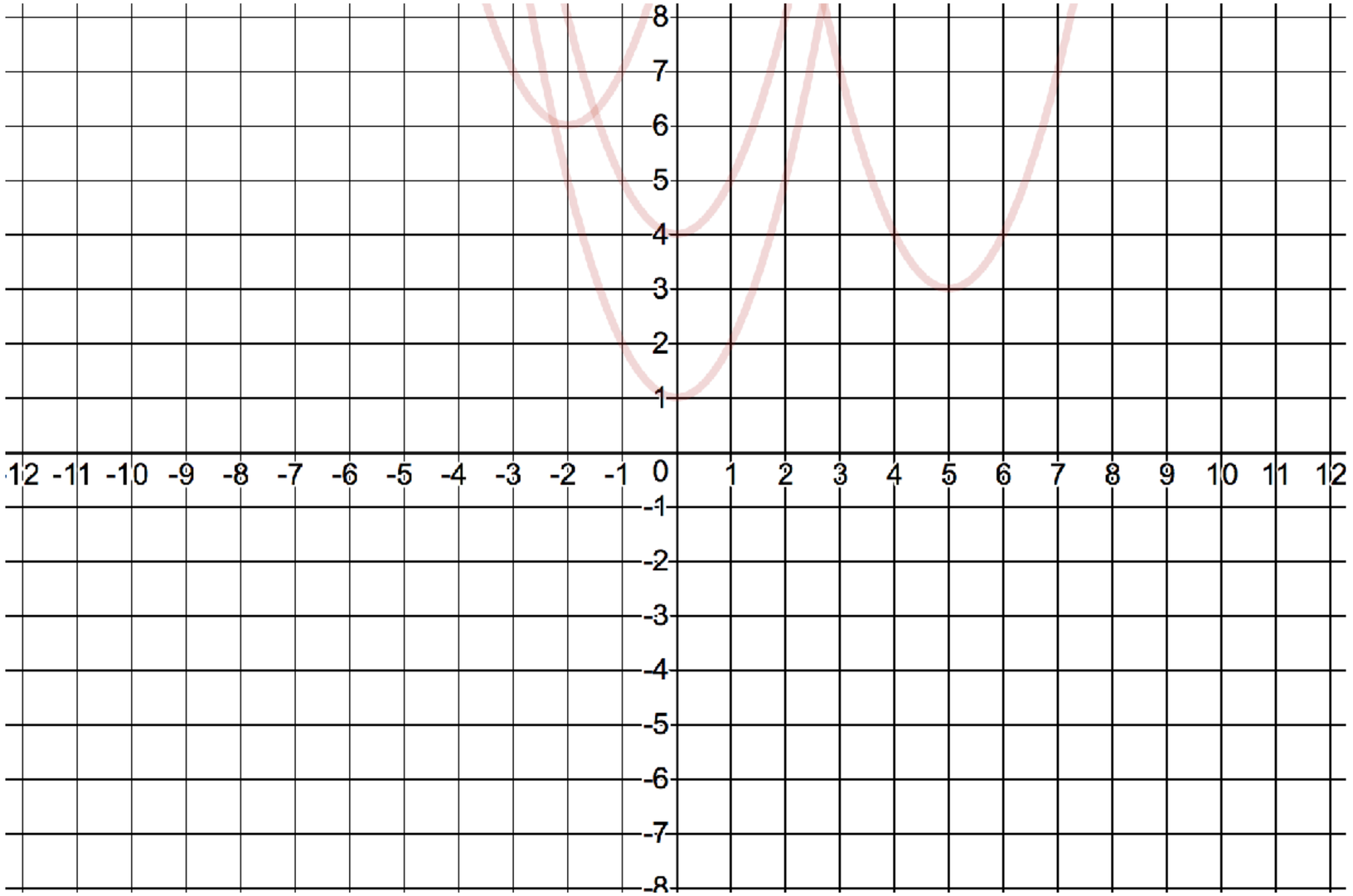
... OPENS UP



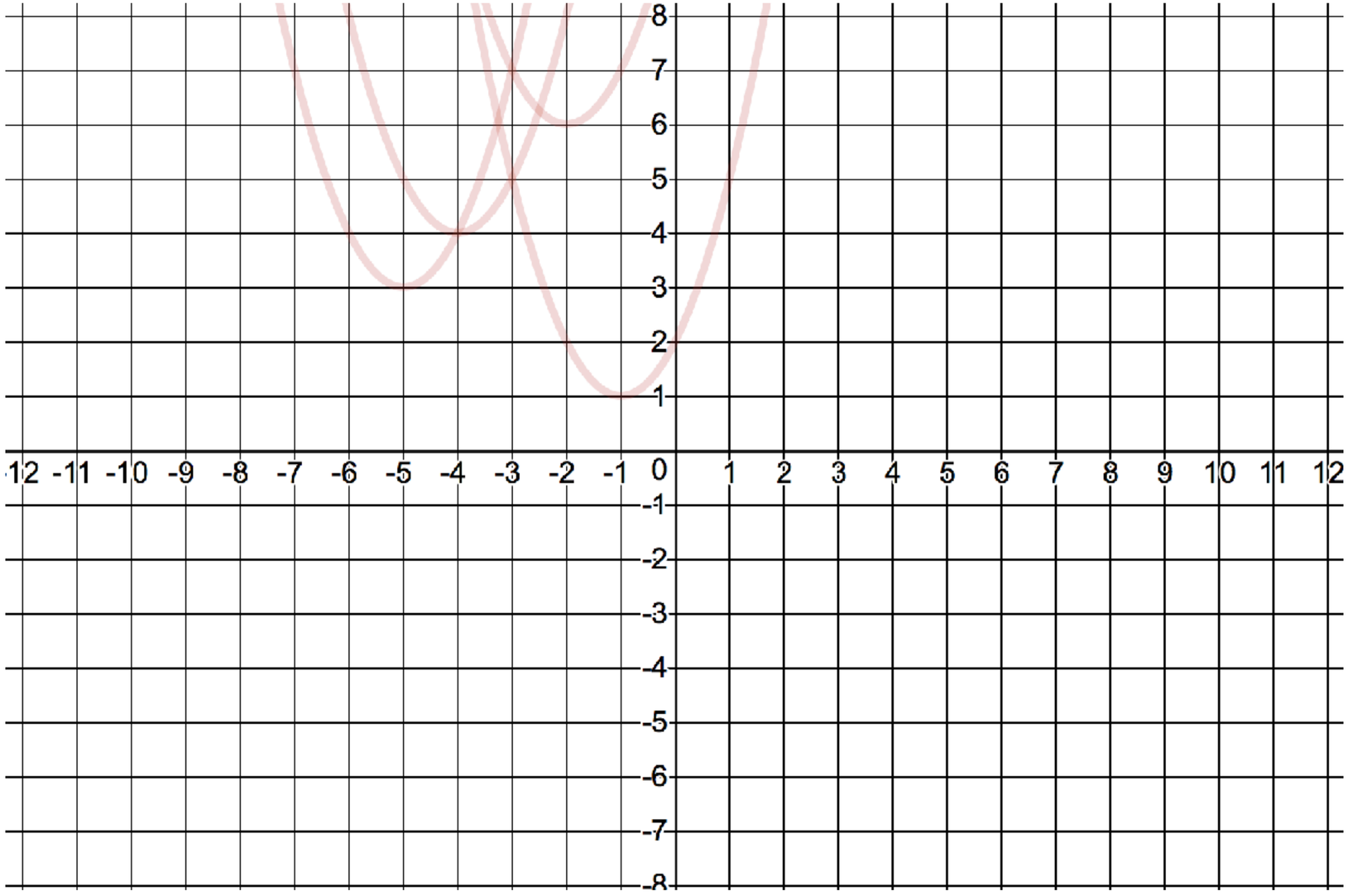
... POSITIVE Y-INTERCEPT



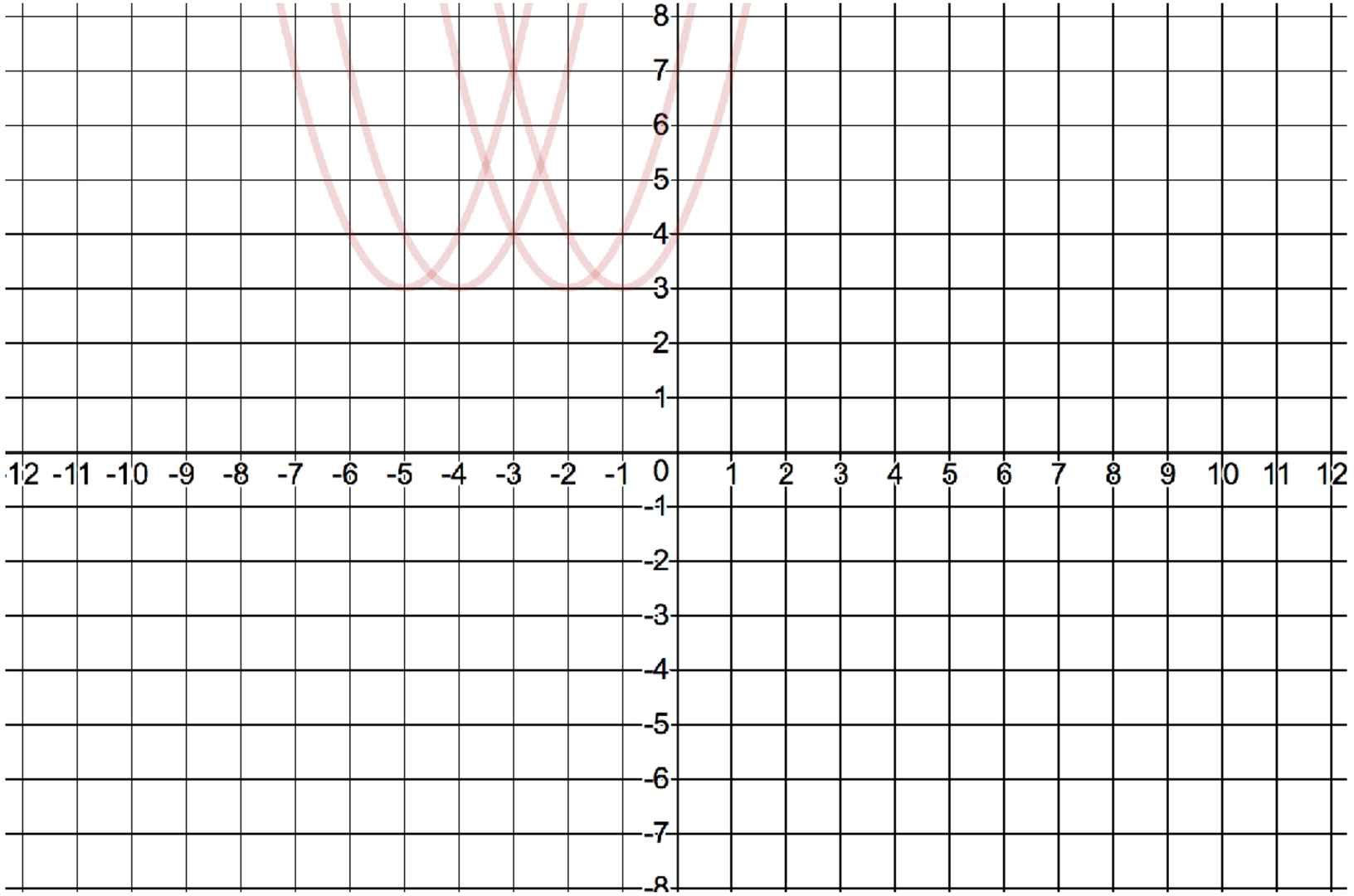
... NO X-INTERCEPTS



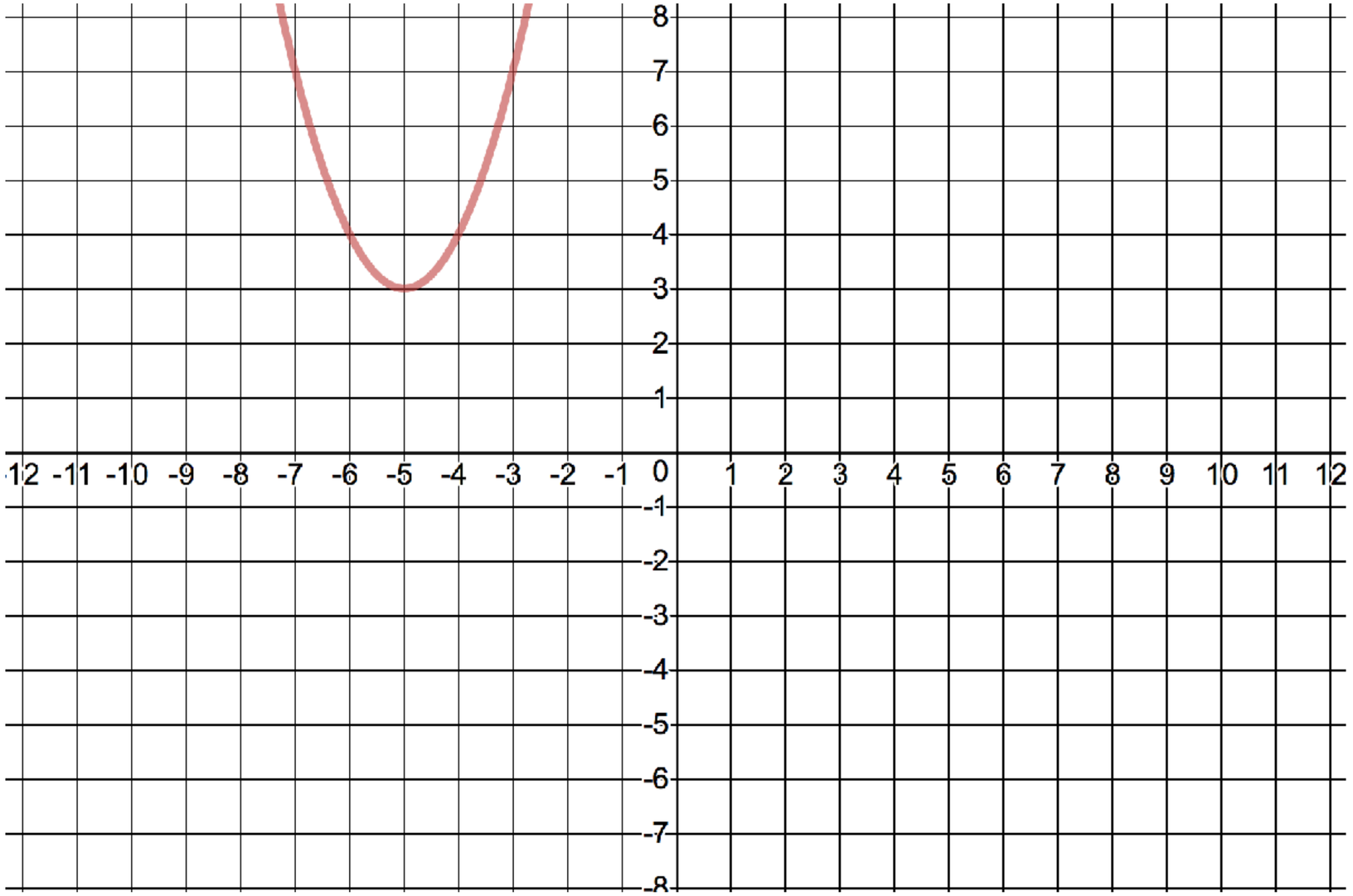
... NEVER ENTERS QIII



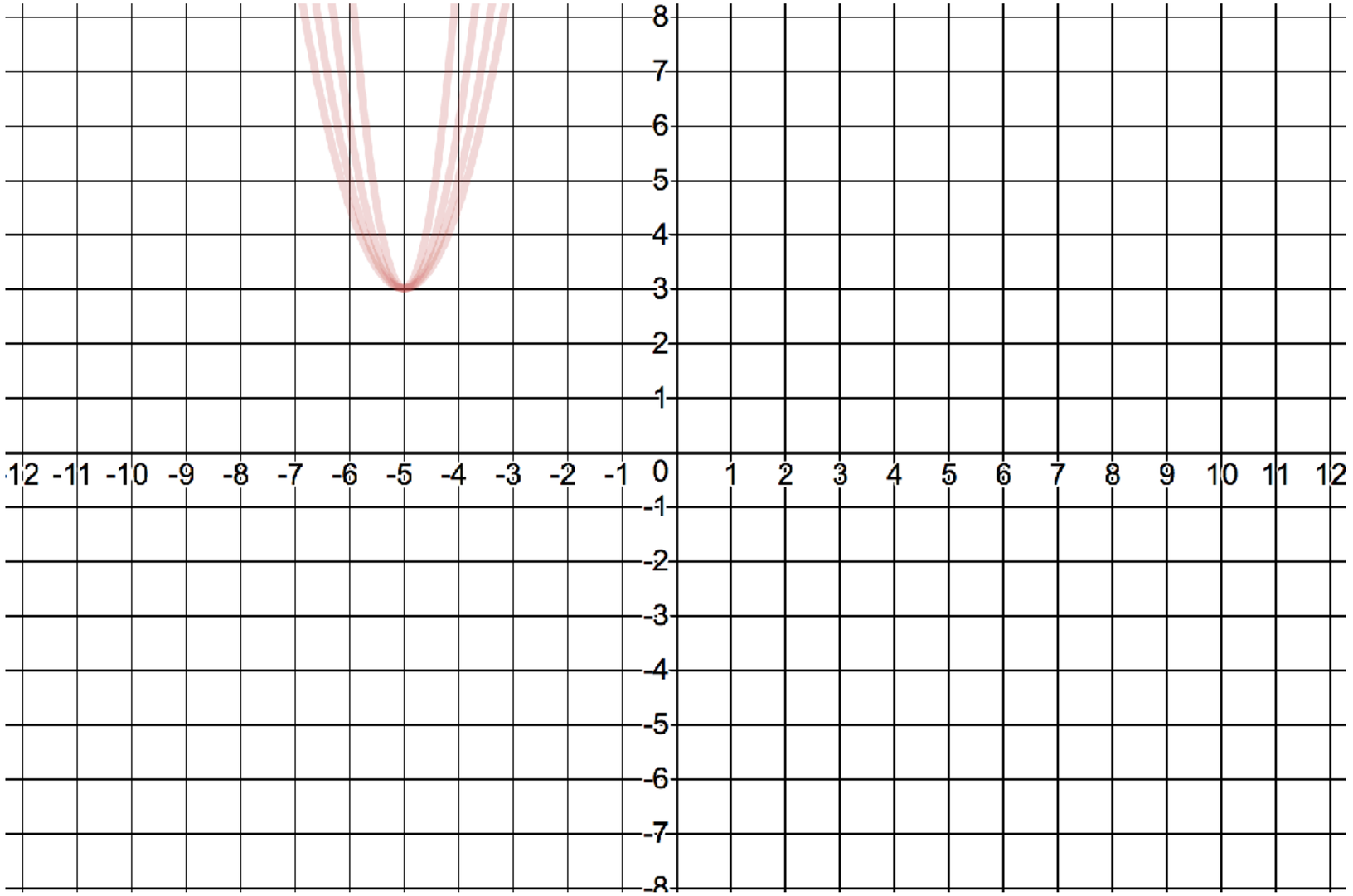
... VERTEX IN QII



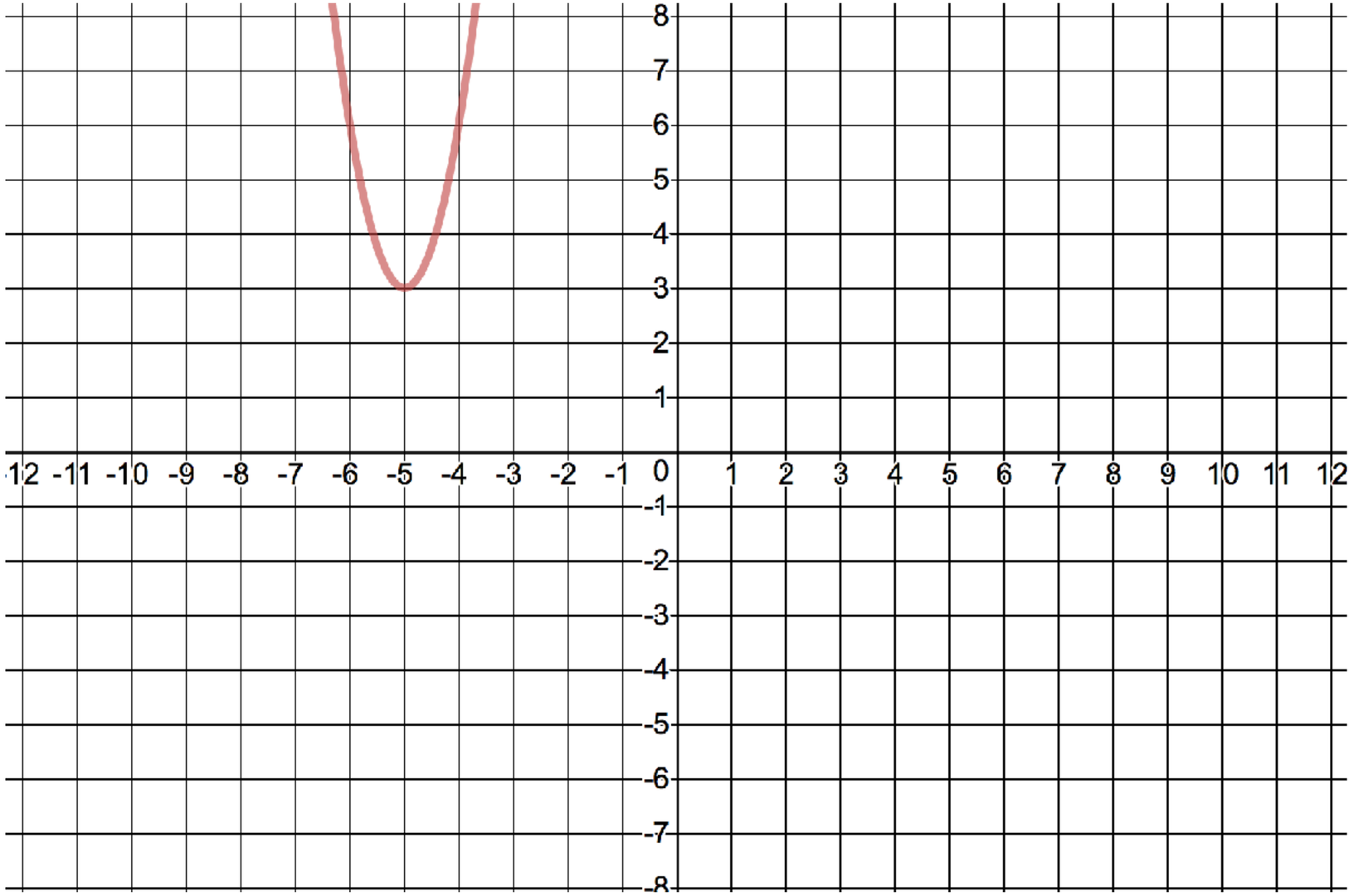
... MINIMUM VALUE OF 3



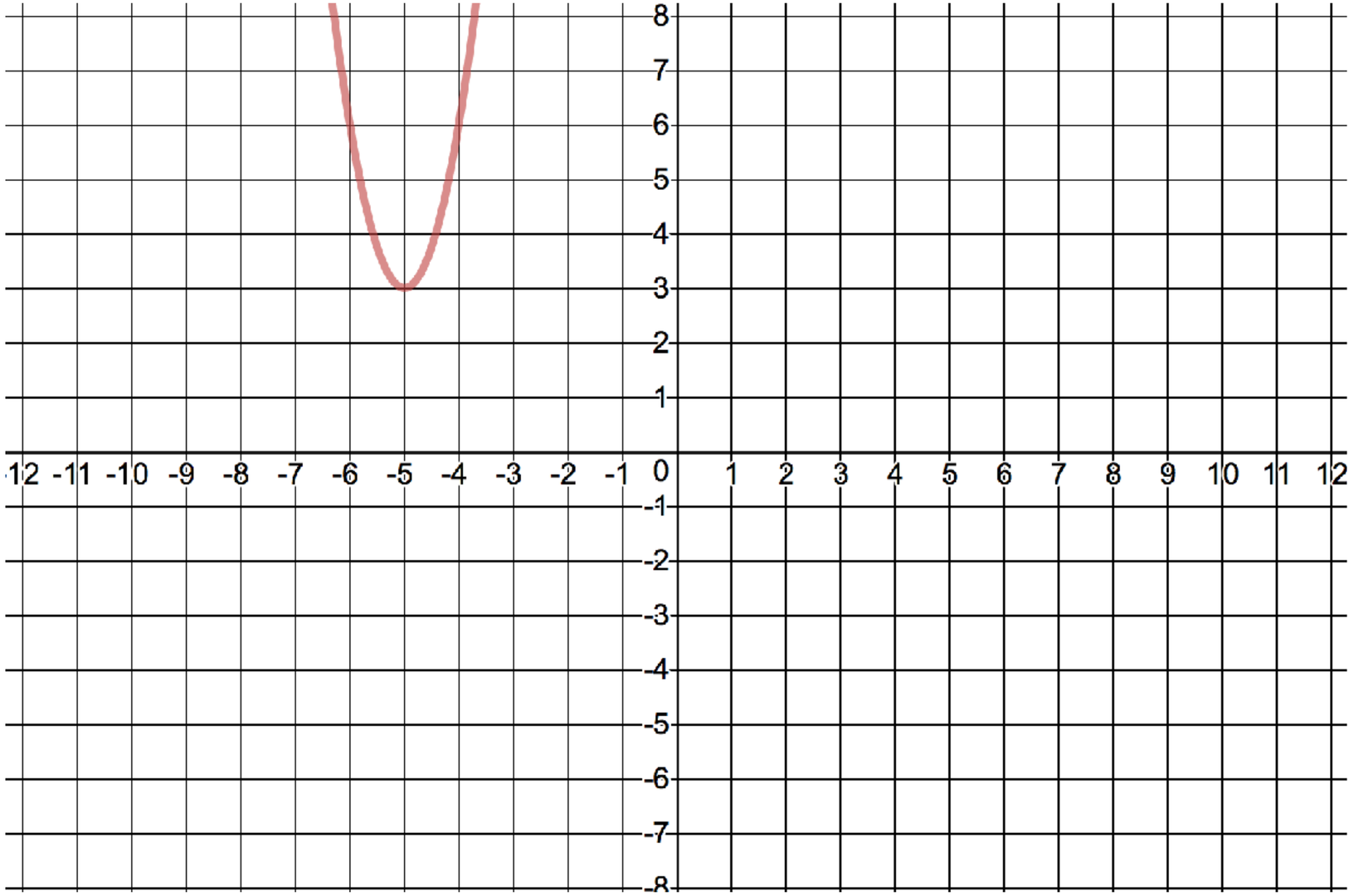
... AXIS OF SYMMETRY X = -5



... VERTICALLY STRETCHED



... PASSES THROUGH (-7, 15)



... VERTEX (-5, 3)

*Which clues were **helpful**?*

*Which clues were **necessary**?*

*What is the **fewest** number of clues you need?*

WANTED

QUADRATIC FUNCTION (A.K.A. "PARABOLA")...

... TWO X-INTERCEPTS

... POSITIVE Y-INTERCEPT

... AXIS OF SYMMETRY $x = 2$

... VERTEX IN QI

... OPENS DOWN

... RANGE $y \leq 4$

... CONTAINS POINTS IN ALL FOUR QUADRANTS

... VERTEX $(2, 4)$

... PASSES THROUGH $(5, 1)$

... VERTICALLY SHRUNK

WANTED

QUADRATIC FUNCTION (A.K.A. "PARABOLA")...

... PASSES THROUGH (-2, 14)

... POSITIVE Y-INTERCEPT

... DOES NOT CONTAIN POINTS IN QIII, QIV

... OPENS UP

... VERTEX IN QII

... AXIS OF SYMMETRY X = -4

... PASSES THROUGH (-6, 14)

... VERTICALLY STRETCHED

... VERTEX (-4, 6)

... PASSES THROUGH (-3, 8)

WANTED

LINEAR RELATION (A.K.A. "LINE")...

... POSITIVE Y-INTERCEPT

... NEVER PASSES THROUGH QIII

... POSITIVE X-INTERCEPT

... PERPENDICULAR TO $Y = \frac{1}{2}X + 3$

... DECREASES FROM LEFT TO RIGHT

... SLOPE = -2

... X-INTERCEPT = 4

... HAS THE SAME Y-INTERCEPT AS $8X - 3Y + 24 = 0$

... PASSES THROUGH (1, 6)

A.	Has a positive slope	B.	Has a positive y-intercept
C.	Has a negative x-intercept	D.	Never enters Quadrant I
E.	Passes through (2, -3)	F.	Has a negative y-intercept
G.	Has a negative slope	H.	Passes through (4, 0)
I.	Never enters Quadrant III	J.	Has a slope less than 1

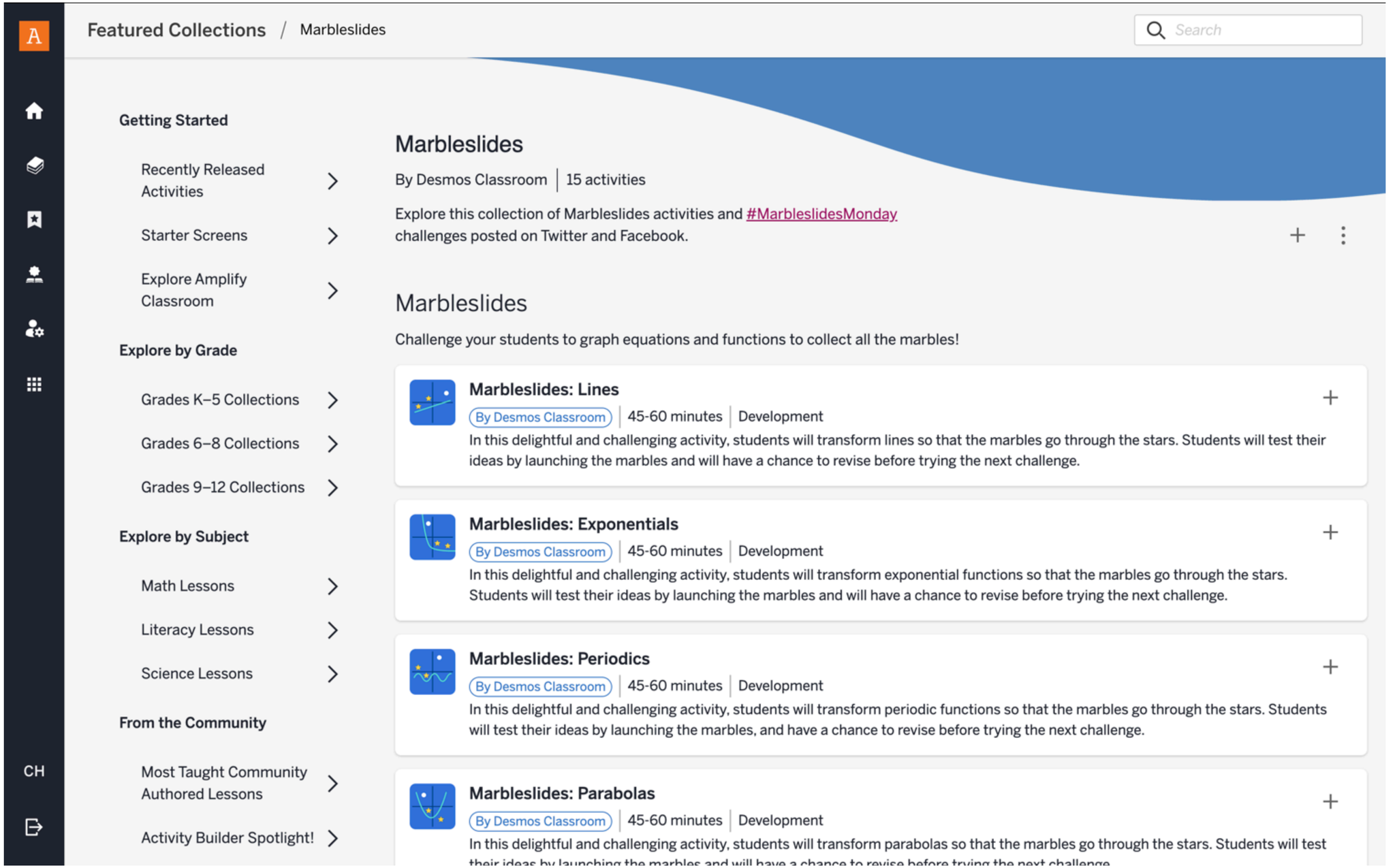
A.	Two negative x-intercepts	B.	Vertex in Quadrant II
C.	Never enters Quadrant III	D.	Vertex on the y-axis
E.	Positive y-intercept	F.	No x-intercepts
G.	Never enters Quadrant I	H.	Has a minimum value
I.	Horizontally stretched	J.	Line of symmetry enters Quadrant IV

*Which constraints **pair nicely**?*

*Which constraints **cannot be paired**?*

Combinations &
Transformations

In which ways can new functions be derived from existing ones?



classroom.amplify.com

Functions

On the grid are eight points from two different functions.

A certain linear function passes through exactly four of the points shown.

A certain quadratic function passes through the remaining four points.

For the **linear** function:

1. Write the coordinate pairs of its four points.

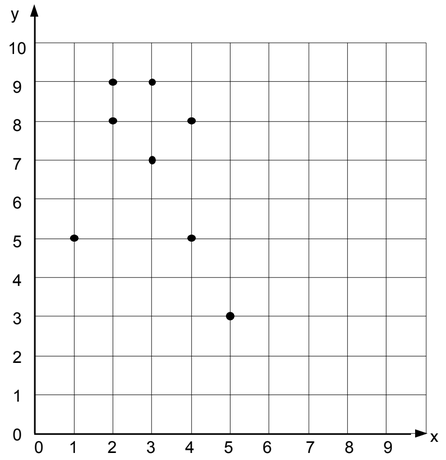
_____

_____

_____

_____

Draw the line on the grid.

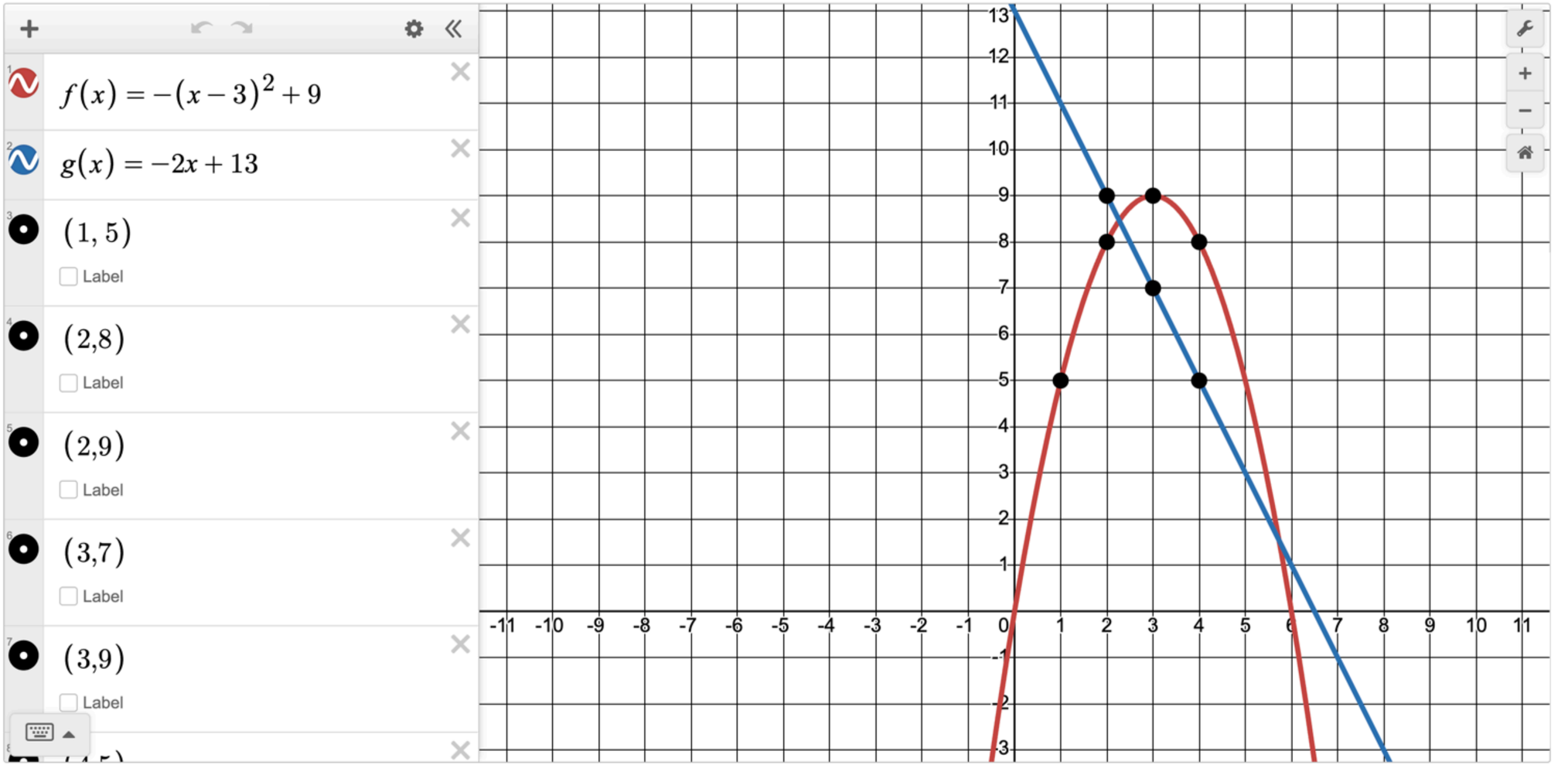


2. Write an equation for the function.

Show your work.

_____

A set of functions pass through the points shown. What could the equations for the functions be?



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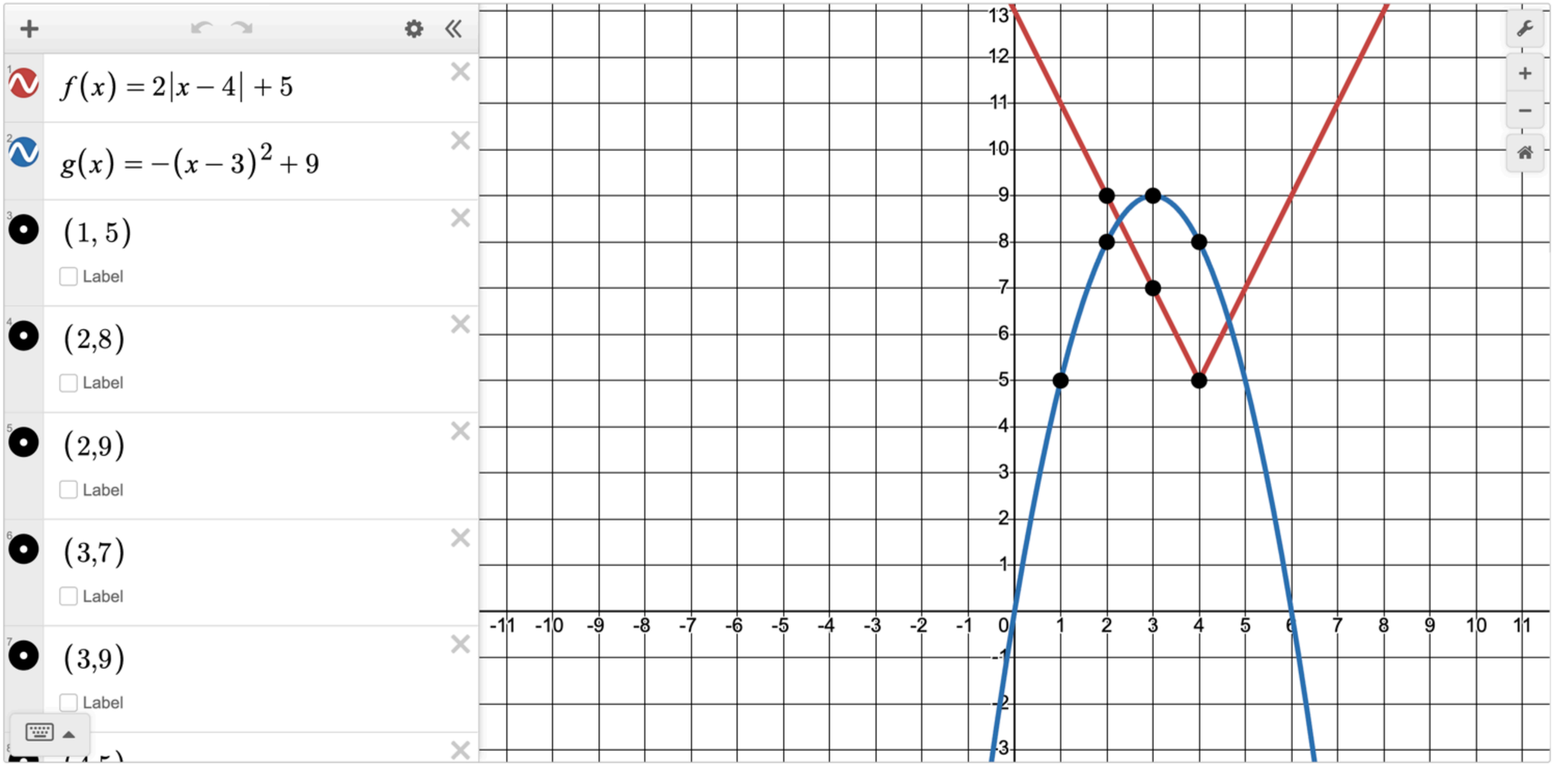

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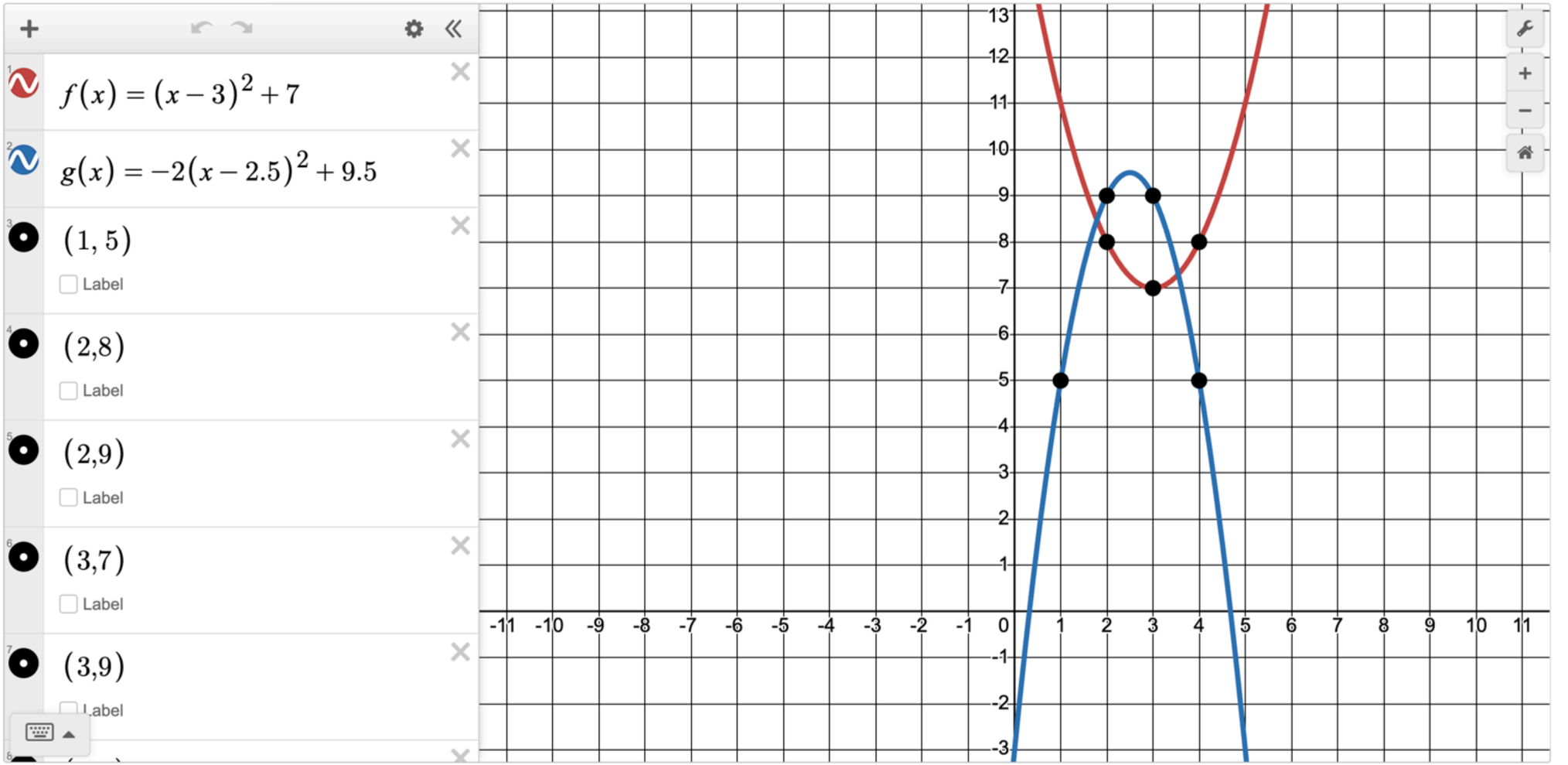

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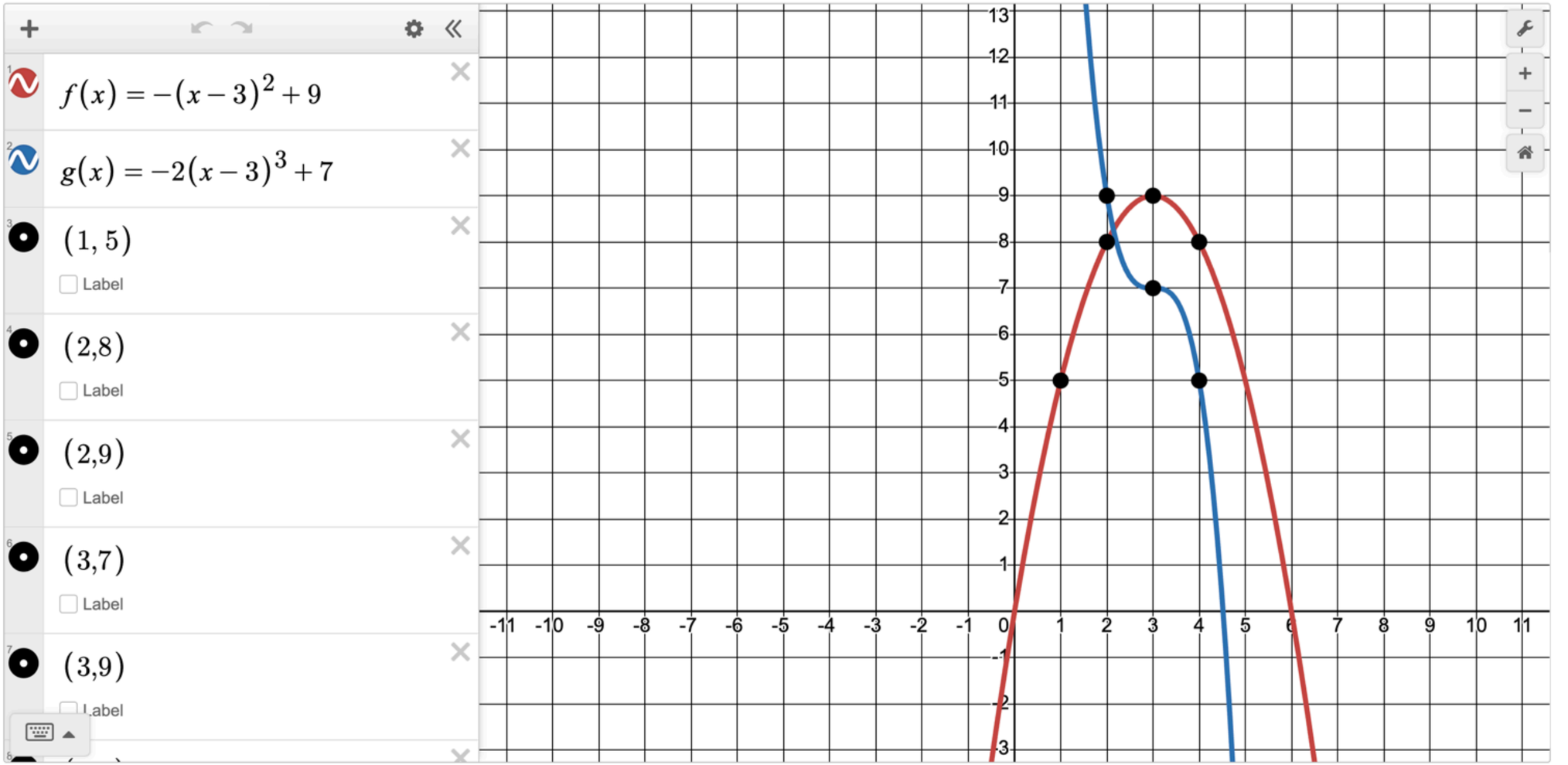

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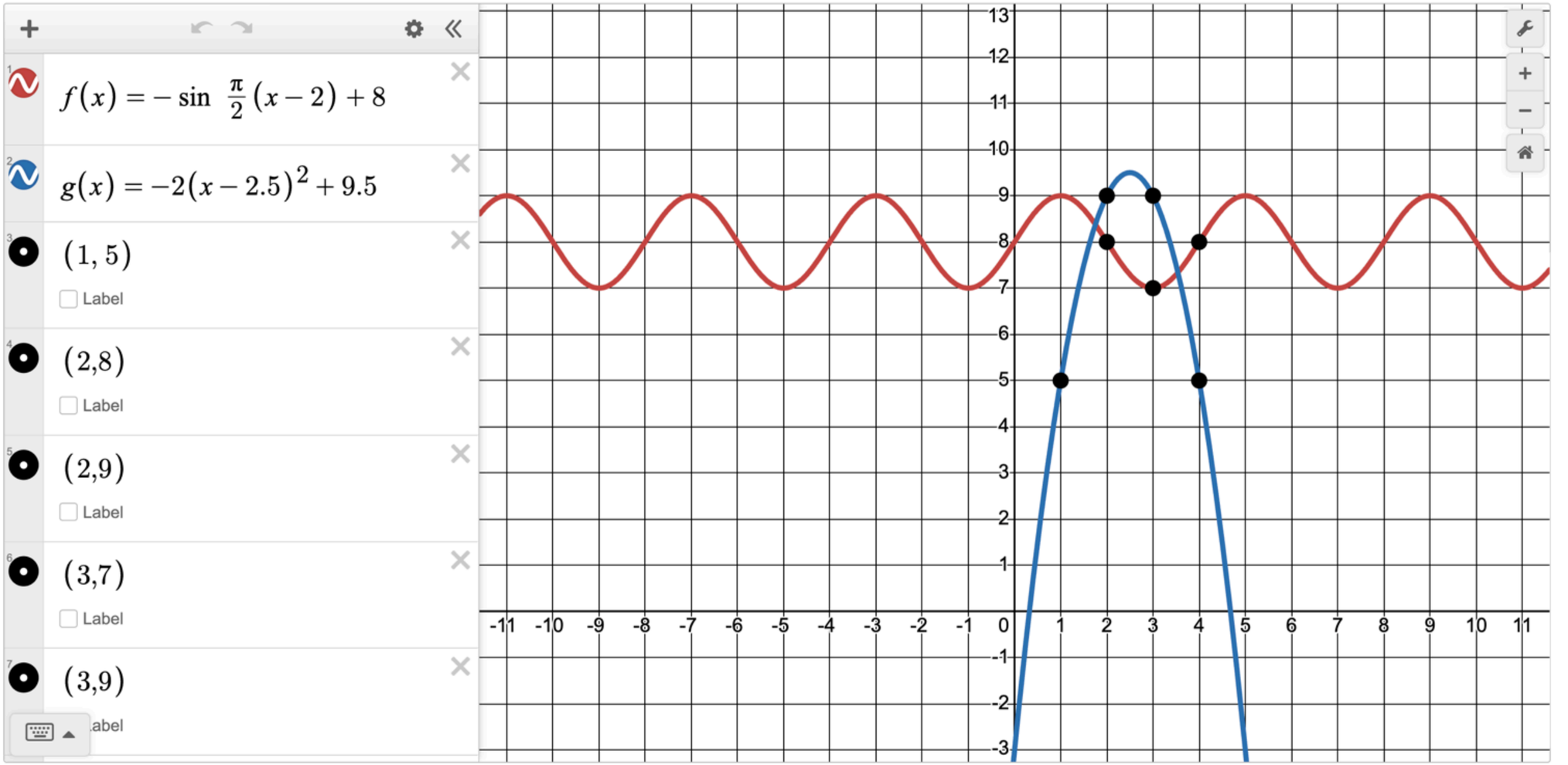


$y = 4x + 7$

Translate three units down

Reflect in the *y*-axis

Translate two units to the left

Reflect in the *x*-axis

$y = 4x - 2$

$y = 4x + 7$

Reflect in the *y*-axis

Reflect in the *x*-axis

Translate three units down

Translate two units to the left

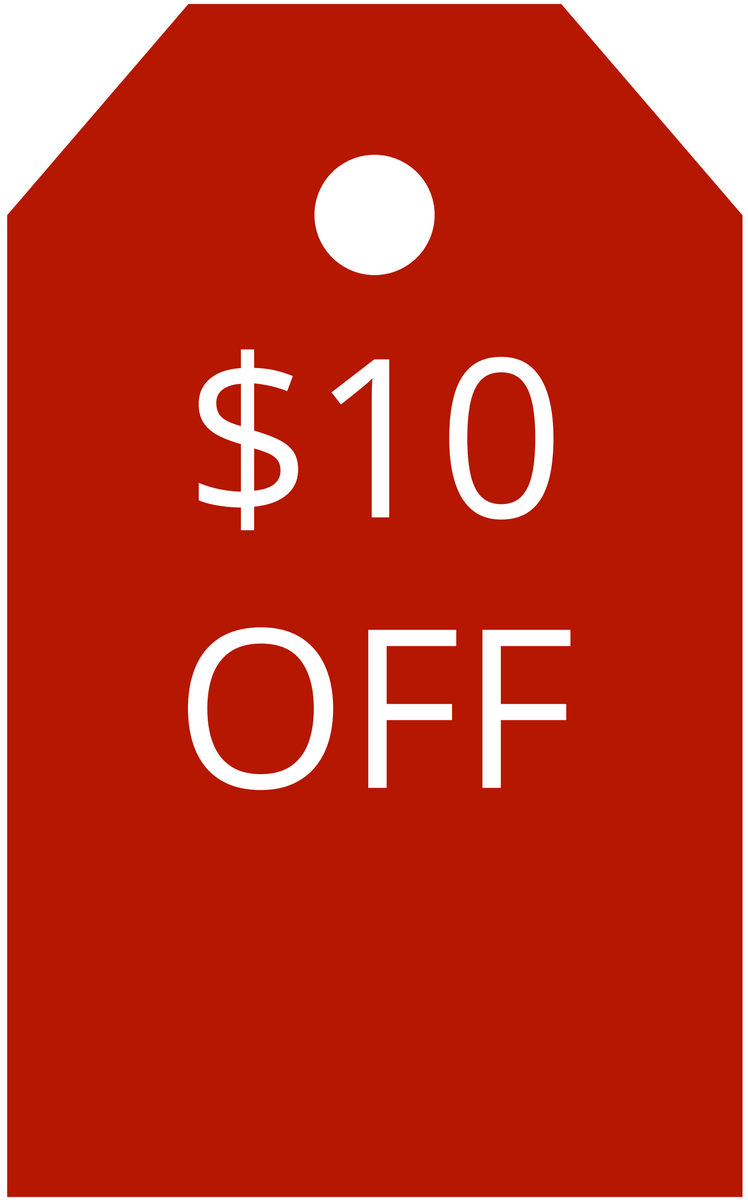
$y = 4x - 2$

There is more than one way of doing this - can you find them all?

Can you explain why different orders can lead to the same outcome?

What other lines could I have ended up with if I had performed the four transformations in a different order?

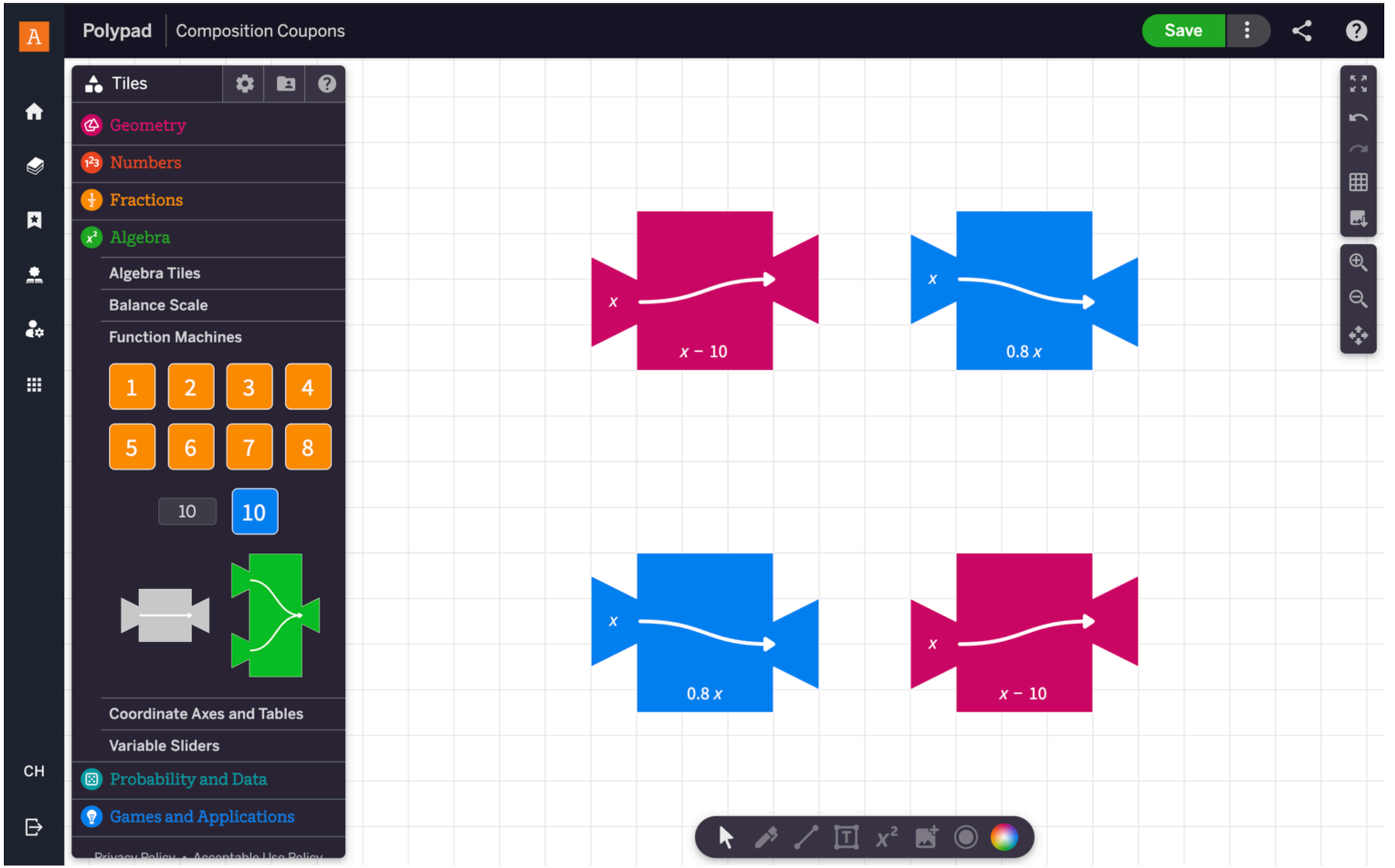
Would you rather...


$10
OFF


20%
OFF


20%
OFF


$10
OFF


Polypad
Composition Coupons
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Geometry
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Fractions
Algebra
Algebra Tiles
Balance Scale
Function Machines
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5
6
7
8
10
10
Coordinate Axes and Tables
Variable Sliders
Probability and Data
Games and Applications
CH
x
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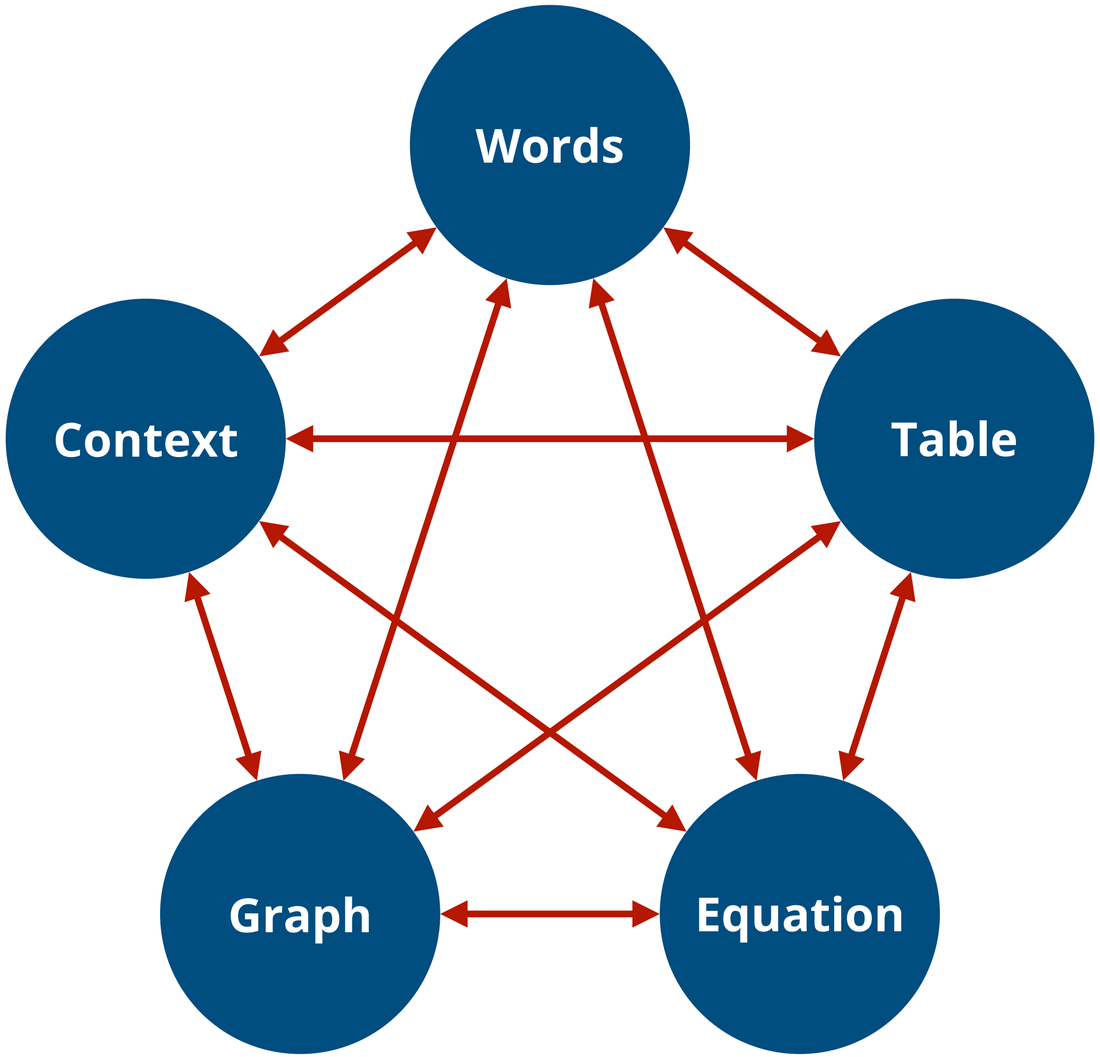
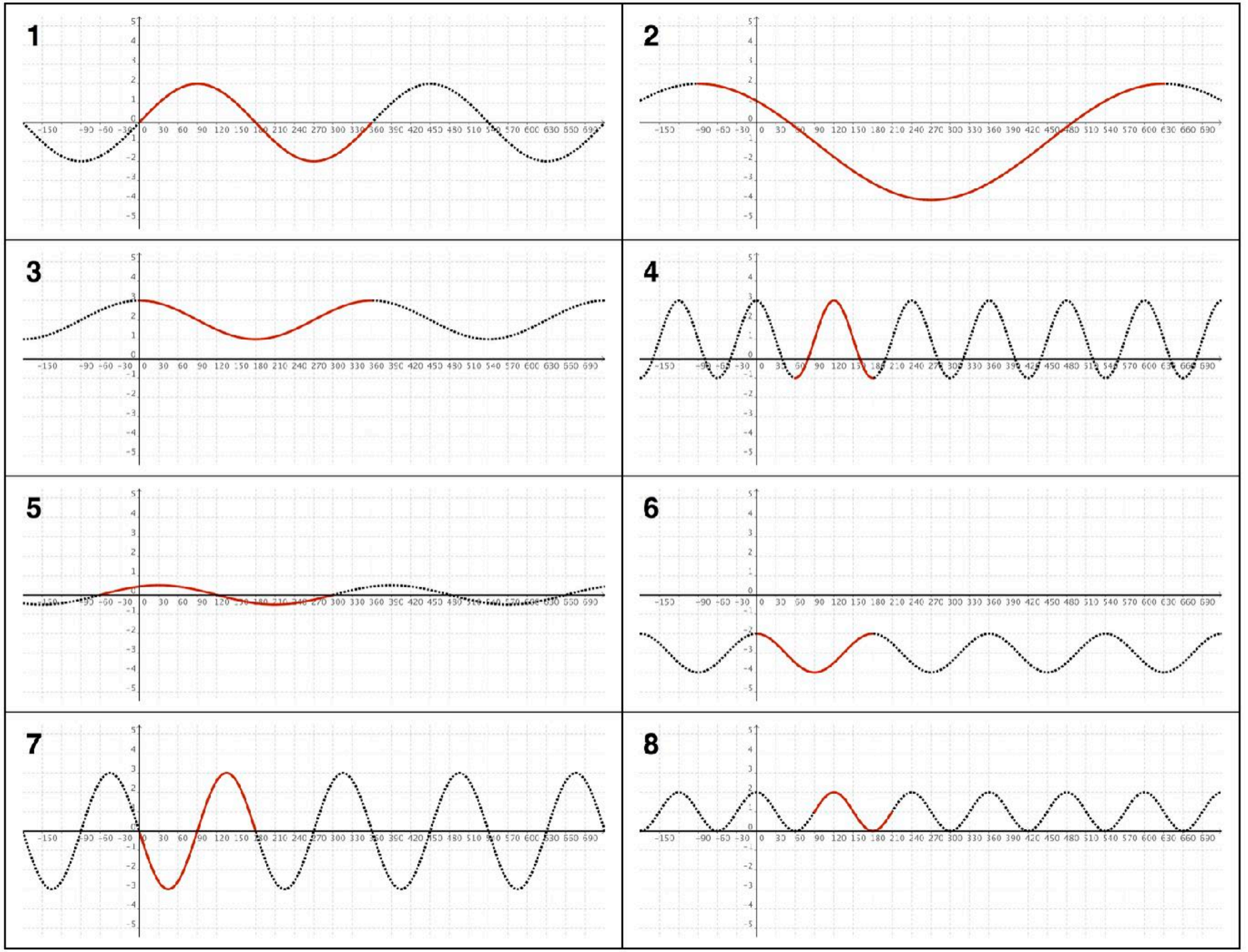
x
0.8 x
x
0.8 x
x
x − 10

Representations


Words
Context
Table
Graph
Equation

How do these characteristics appear in tables, graphs, and equations?

A $y = 2\sin x$	B $y = 3\cos\frac{1}{2}(x + 90°) - 1$
C $y = \cos x + 2$	D $y = -2\cos 3(x - 60°)$
E $y = \frac{1}{2}\sin(x + 60°)$	F $y = \cos 2x - 3$
G $y = -3\sin 2x$	H $y = \sin 3(x - 90°) + 1$



chrishunter.ca

i amplitude: 1 period: 360° maximum: 3 minimum: 1 range: $1 \le y \le 3$ vertical translation: up 2	**ii** amplitude: 1 period: 180° maximum: -2 minimum: -4 range: $-4 \le y \le -2$ vertical translation: down 3
iii amplitude: $\frac{1}{2}$ period: 360° maximum: $\frac{1}{2}$ minimum: $-\frac{1}{2}$ range: $-\frac{1}{2} \le y \le \frac{1}{2}$ horizontal translation: left 60°	**iv** amplitude: 3 period: 180° maximum: 3 minimum: -3 range: $-3 \le y \le -3$ reflection: x-axis
v amplitude: 3 period: 720° maximum: 2 minimum: -4 range: $-4 \le y \le 2$ horizontal translation: left 90° vertical translation: down 1	**vi** amplitude: 2 period: 120° maximum: 2 minimum: -2 range: $-2 \le y \le 2$ horizontal translation: right 60° reflection: x-axis
vii amplitude: 1 period: 120° maximum: 2 minimum: 0 range: $0 \le y \le 2$ horizontal translation: right 90° vertical translation: up 1	**viii** amplitude: 2 period: 360° maximum: 2 minimum: -2 range: $-2 \le y \le 2$

“Admittedly, there’s little cognitive difference between a tactile matching activity and a matching exercise on a worksheet. However, **in a card sort, the emphasis rests on the conversation among students** rather than the conversation between the student and the worksheet. **Because students can arrange and rearrange shapes or cards on the table, they naturally refine and test ideas, and talk about them.** In this way, card sorts can reinforce our message that mistakes are learning opportunities.”

Krall, G. (2018). *Necessary conditions: Teaching secondary math with academic safety, quality tasks, and effective facilitation*. Stenhouse.

Open Middle

$$f(x) = (x - \square)(x - \square)$$

$$f(x) = (x - \square)^2 - \square$$

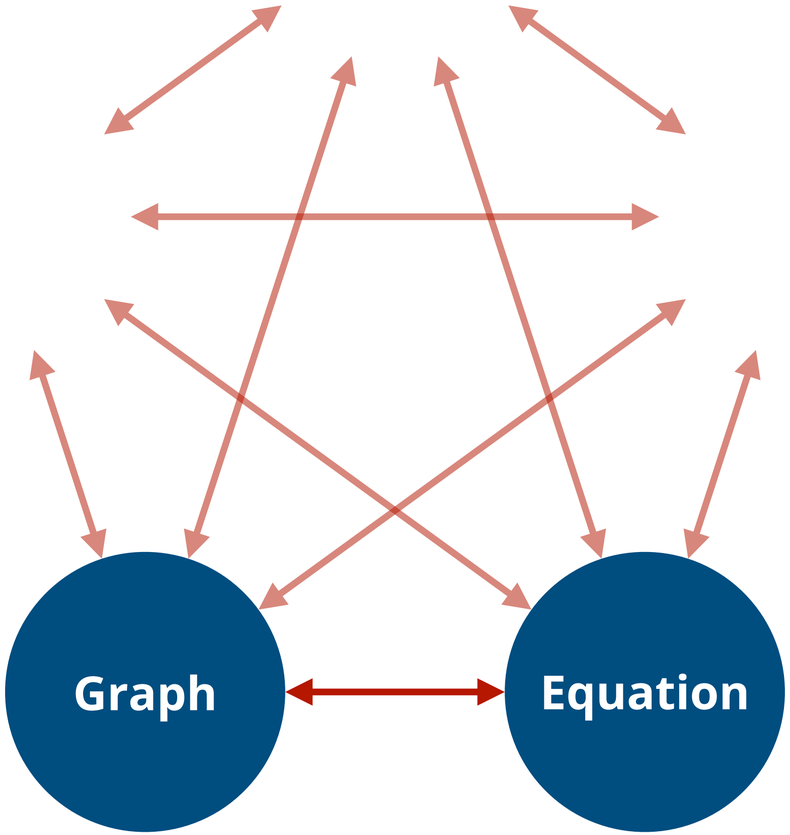
1 2 3 4 5 6 7 8 9

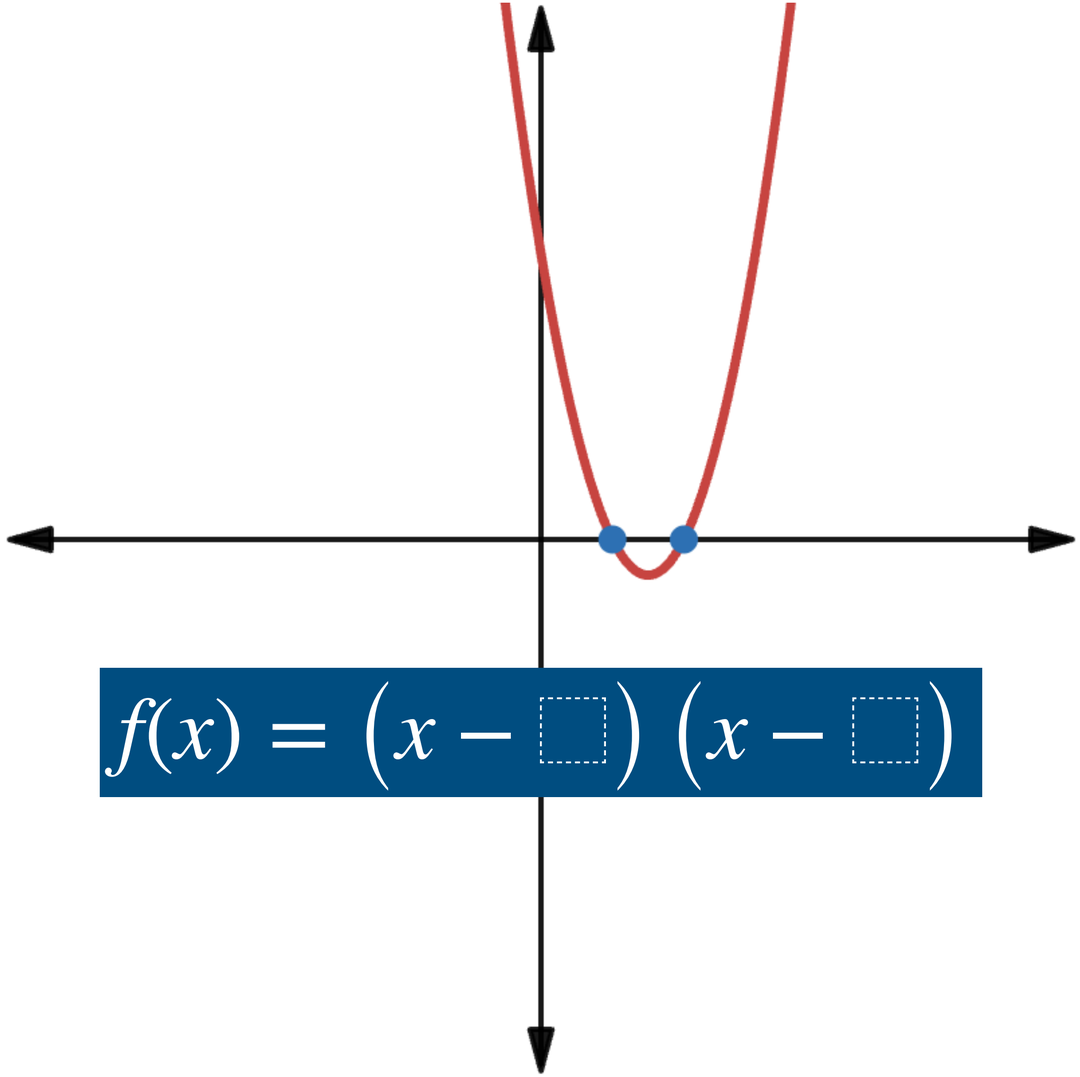
$$f(x) = (x - \square)(x - \square)$$

$$f(x) = (x - \square)^2 - \square$$

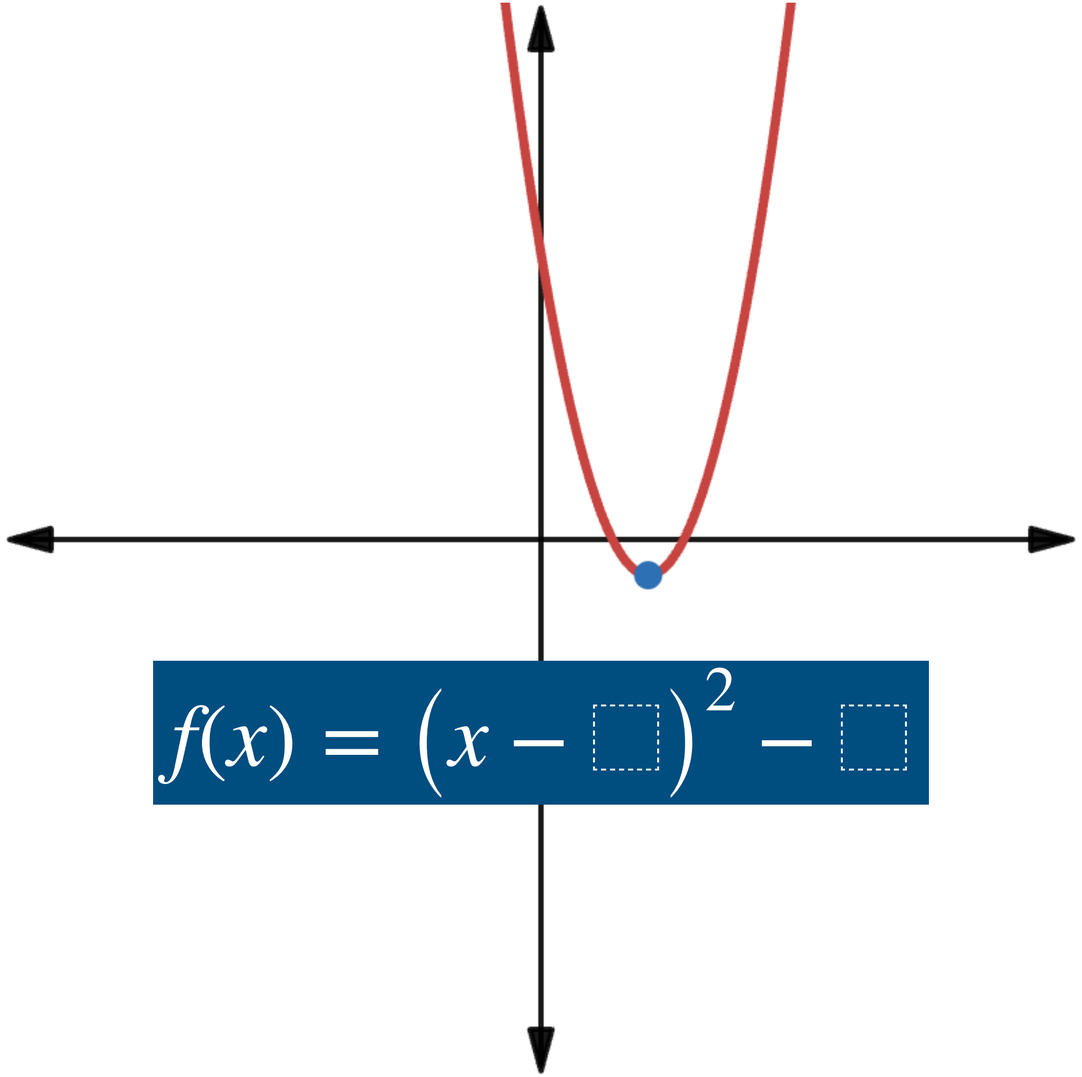
$$f(x) = x^2 - \square x + \square$$

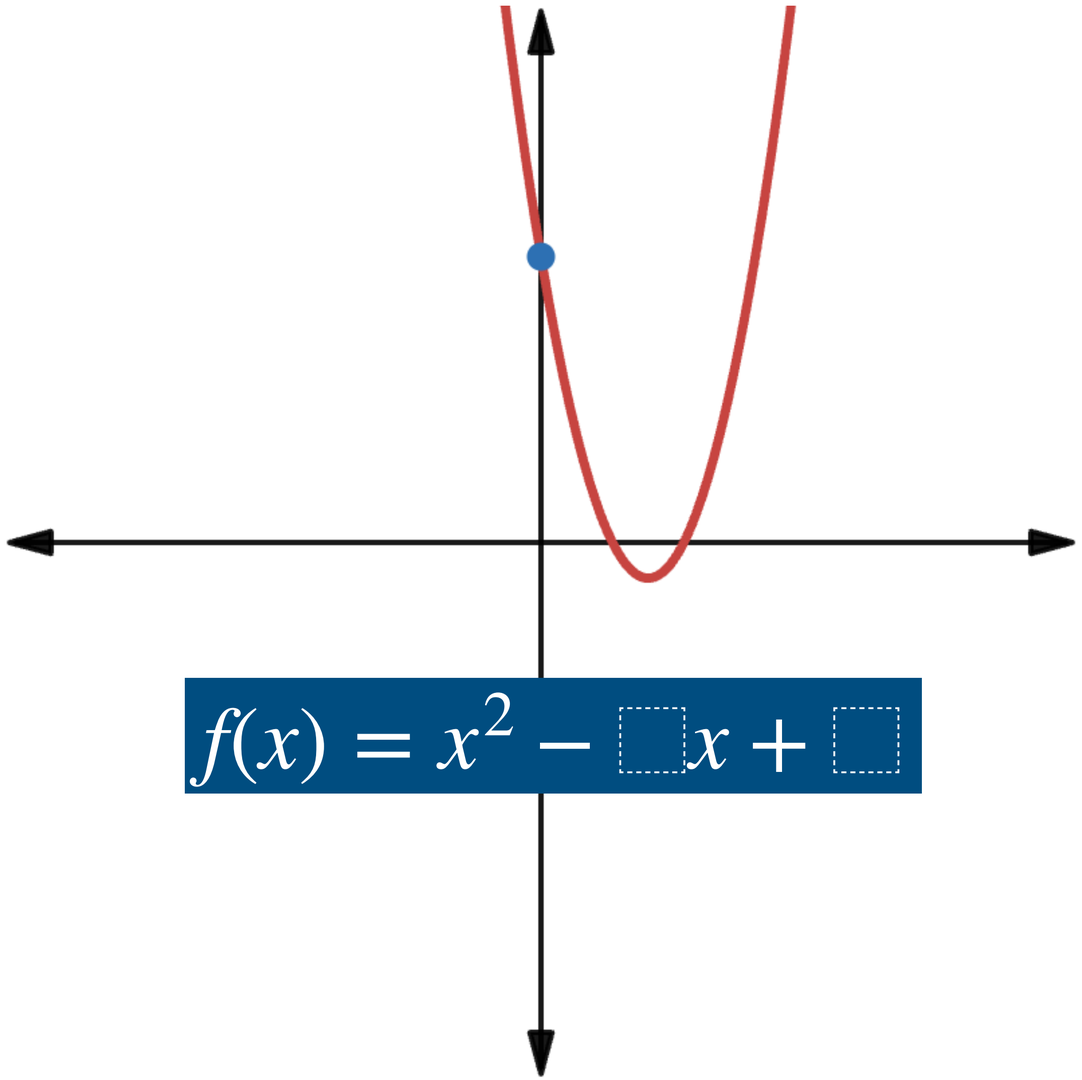
1 2 3 4 5 6 7 8 9

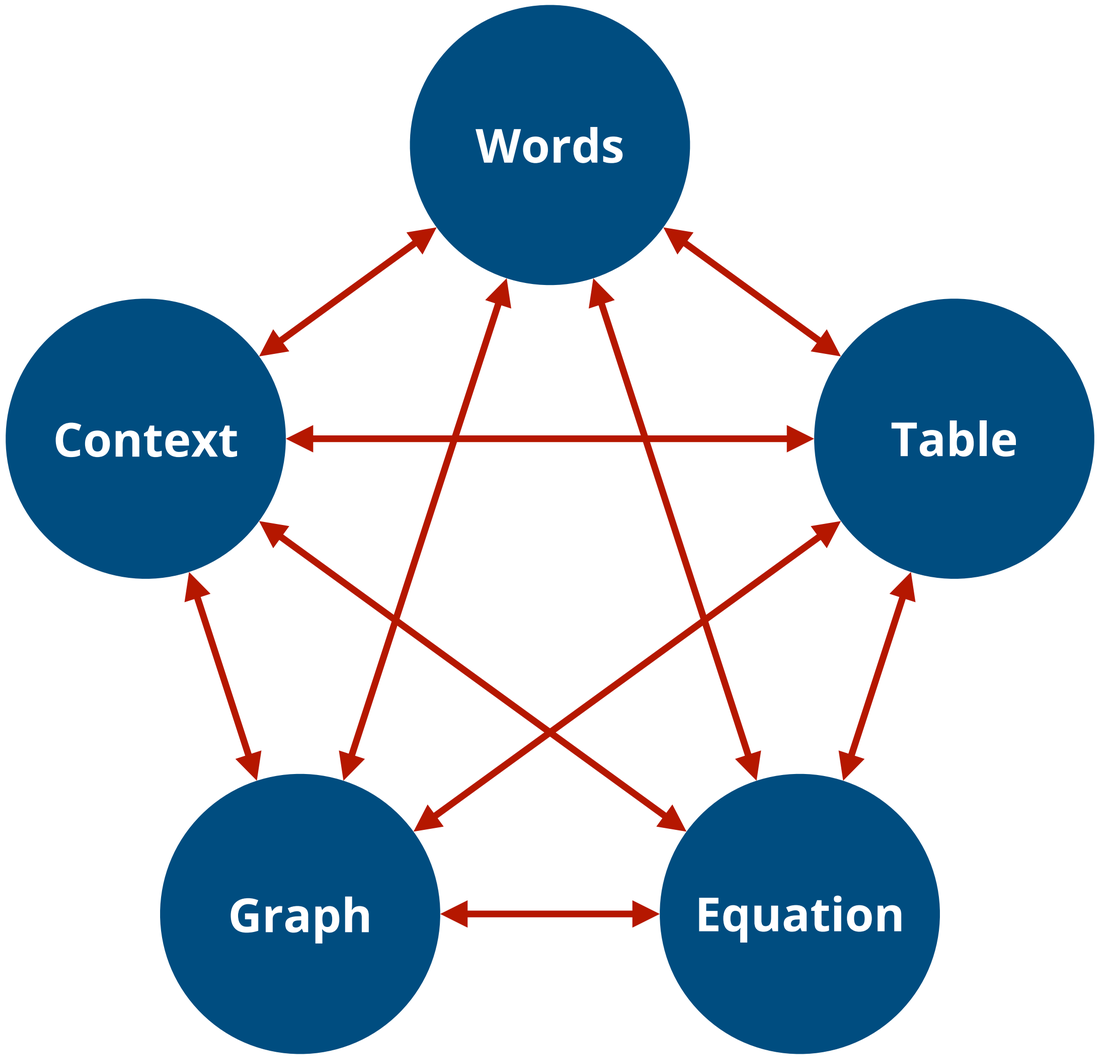

Graph
Equation



$$f(x) = (x - \square)(x - \square)$$


$f(x) = \left(x - \square\right)^2 - \square$


$f(x) = x^2 - \square x + \square$


Words
Context
Table
Graph
Equation

Once upon a time, there was a thirsty crow.

She came upon a pitcher that had some water in it, but when she put her beak into the pitcher she found she could not reach the water.

Then, she had an idea.

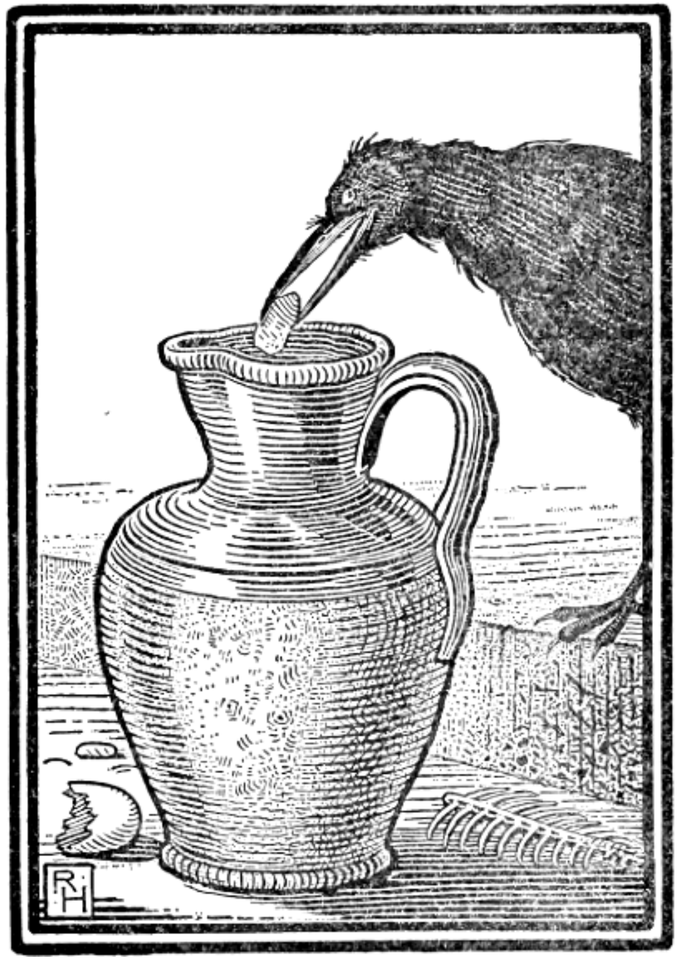
She looked around, found a pebble, and dropped it into the pitcher.

The water rose a little bit.

The crow was encouraged and continued to drop pebbles into the pitcher, one at a time, until the water rose up high enough for the crow to reach it with her beak.

The crow drank and was satisfied!

Moral: **“Little by little does the trick.”**



*Which representation is the **best**?*

*“The **table** is the best. It helps me keep track of the data and find the pattern.”*

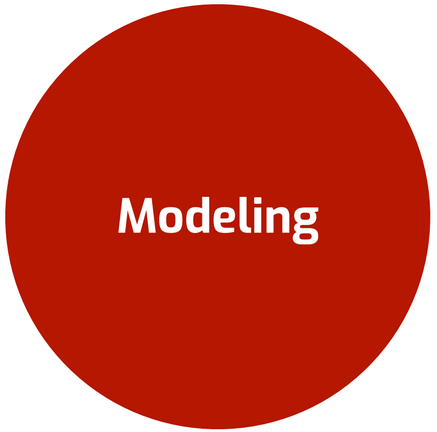
*“The **equation** is the best. It tells me the rate of change without me needing to calculate it. I can quickly solve it to figure out the number of pebbles that I’ll need.”*

*“The **graph** is the best. It shows the relationship between the variables right away.”*

*“You need to fill in a lot of rows in the **table** before you get to 100 mL.”*

*“The **equation** is unnecessary. I can use arithmetic, not algebra, to figure out how many pebbles it will take.”*

*“It’s difficult to sketch the **graph** accurately and read when y hits 100.”*


Modeling

How can I make predictions about real-world phenomena?

Act 1

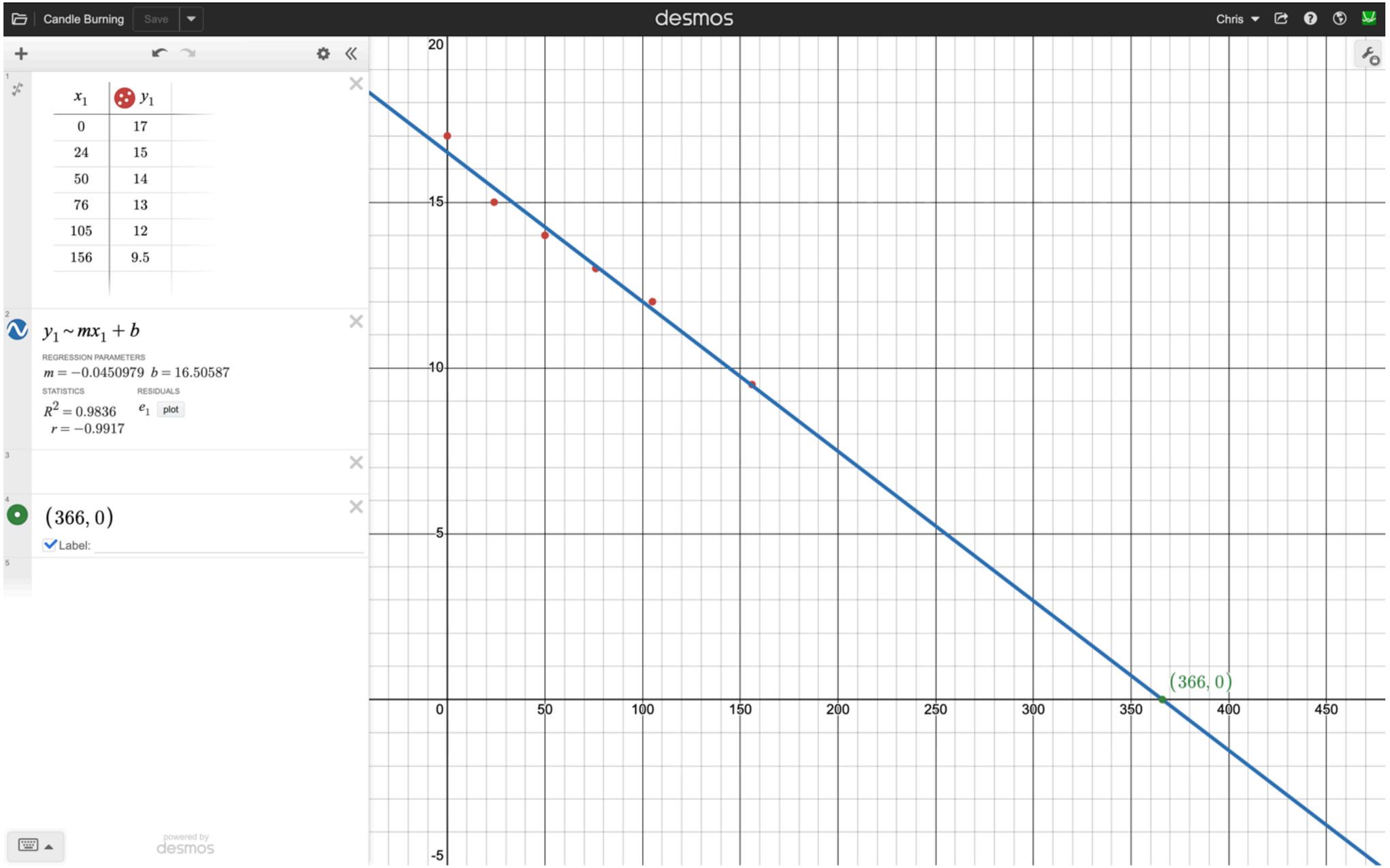

TapintoTeenMinds.com

Act 2

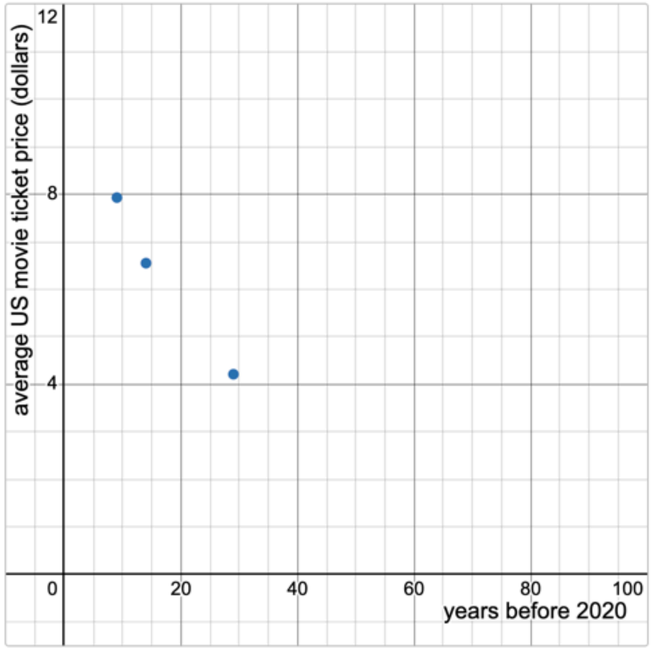

TapintoTeenMinds.com

Act 3


TapintoTeenMinds.com


Candle Burning
Save
desmos
Chris
x_1 y_1
0 17
24 15
50 14
76 13
105 12
156 9.5
$y_1 \sim mx_1 + b$
REGRESSION PARAMETERS
$m = -0.0450979$ $b = 16.50587$
STATISTICS
$R^2 = 0.9836$
$r = -0.9917$
RESIDUALS
e_1 plot
$(366, 0)$
Label:
powered by desmos
20
15
10
5
0
-5
50
100
150
200
250
300
350
400
450
$(366, 0)$

Build a model.



The blue points represent average US movie ticket price for several years.

What kind of function will best fit the data?

After you make your selection, drag the red points to fit the function to the data.

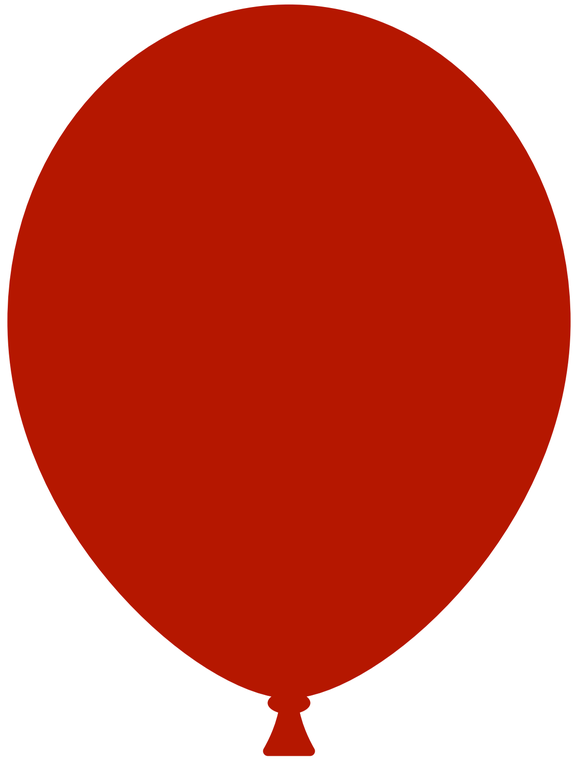
- ○ Linear
- ○ Quadratic
- ○ Exponential

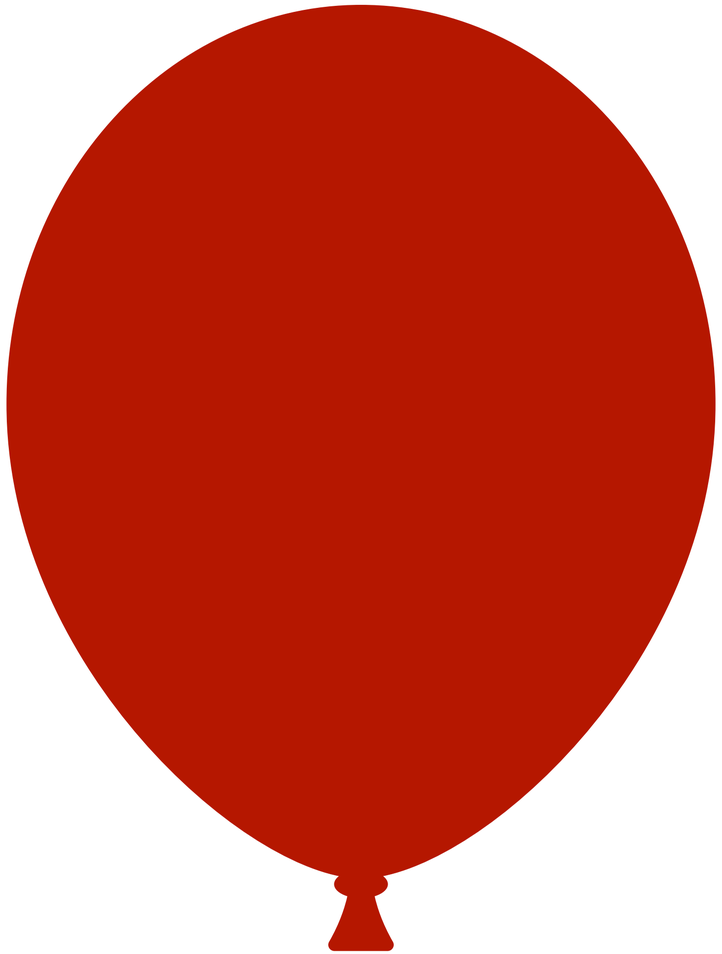
Teacher Moves

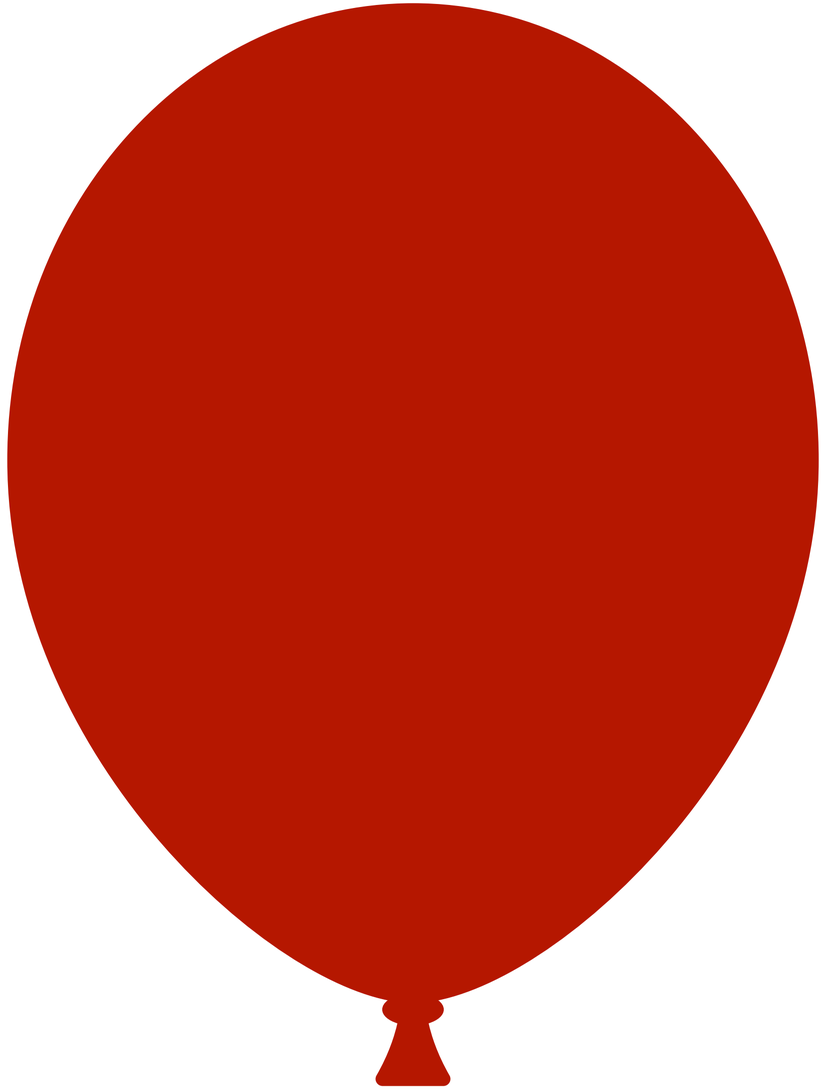
Use the teacher dashboard to see a visual summary of student responses.

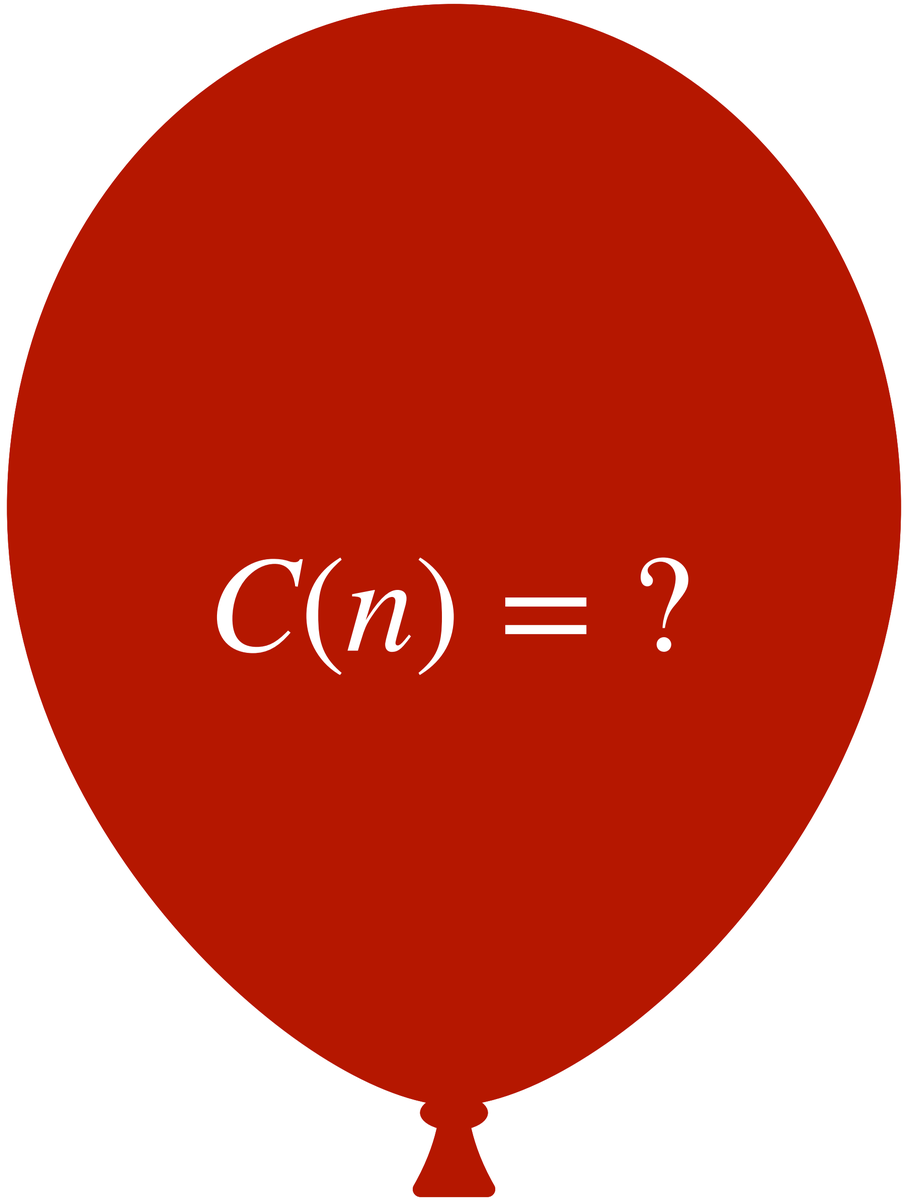
Before correcting students who select an inappropriate model, let them feel the "consequence" of their choice on the next screen.

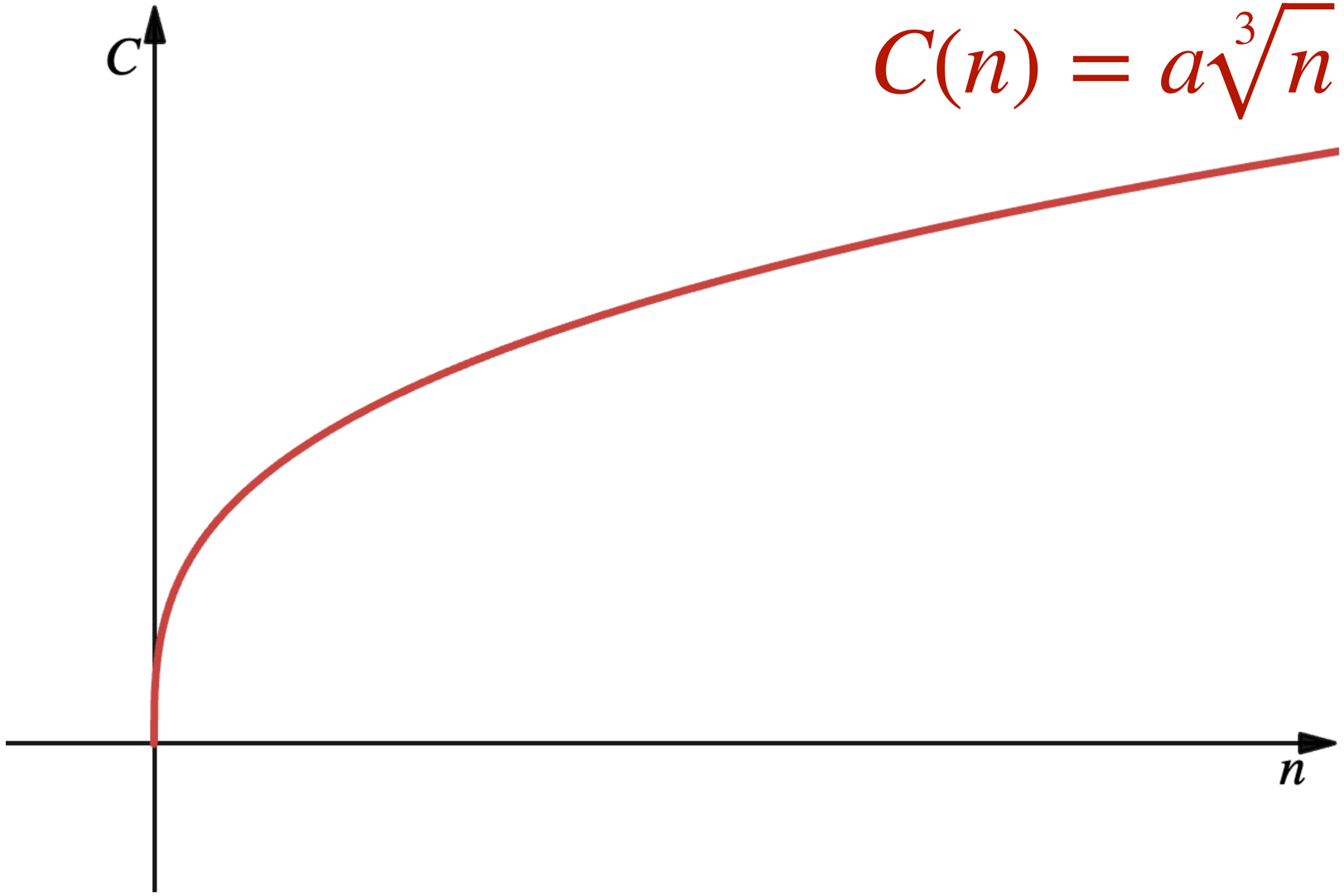
Dashboard Note: ✅ indicates that the student selected "Exponential" and that the model fits the data well.








$C(n) = ?$


C
n
$C(n) = a\sqrt[3]{n}$

Which One Doesn’t Belong?	chrishunter.ca/2017/11/01/alike-different-which-one-doesnt-belong-more/
What’s the Function?	polypad.org/kNif7EN4EVXZvA
Dynagraphs	classroom.amplify.com/activity/68c1b8395ad18d0bcd331bff
Wanted Parabola	chrishunter.ca/2019/01/08/wanted-parabola/
Menu Math	natbanting.com/menu-math
Marbleslides	classroom.amplify.com/collection/632c77b104648305feffcfda
Functions	map.mathshell.org/tasks.php?unit=HA07
Surprising Transformations	nrich.maths.org/problems/surprising-transformations
Composition Coupons	polypad.org/D8sg4AEVjcGBA
Sinusoidal Sort	chrishunter.ca/2013/11/06/sinusoidal-sort/
Open Middle	openmiddle.com/identical-quadratics-2/
Candle Burning	tapintoteenminds.com/3act-math/candles-burning/
Predicting Movie Prices	classroom.amplify.com/activity/581394efa64518b3069b6de7

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