

What is found in an Engaging Mathematics TEKS-based activity?

Each activity addresses a specific student expectation that is reflected in the content objective.

Key Features of Functions, Activity 4 P(2)(1)

Activity Objectives

I can describe the key features of a piecewise function.

I can describe how to determine the zero(s) of a piecewise function.

Materials

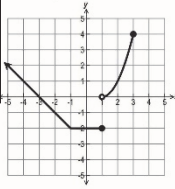
- Piecewise Features

Common classroom materials are used for ease of preparation. Materials are listed 1-per-student unless otherwise noted. Page titles for student handouts are bolded.

ELPS have been included in the form of a student-friendly language objective.

Answer Key

$$f(x) = \begin{cases} -x - 3, & x \leq -1 \\ -2, & -1 < x < 1 \\ (x - 1)^2, & 1 \leq x \leq 3 \end{cases}$$



Statements

- The function has a domain of all real numbers less than or equal to 3.
- The range of the function is all real numbers.
The range of the function is all real numbers greater than or equal to -2.
- The function is constant on the interval $(-1, 1)$.
- The y-intercept of the graph of the function is at -2 .
- The function is decreasing on the interval $(-2, \infty)$.
The function is decreasing on the interval $(-\infty, -1)$.
- The function is increasing on the interval $(-1, 4)$.
The function is increasing on the interval $(1, 3)$.
- The function has two zeros, when $x = -3$ and when $x = 1$.
The function has one zero, when $x = -3$.
- The graph is not symmetric about the origin.

It is assumed all student have access to graphing technology due to the advanced nature of the content.

An answer key is included for each activity.

Debriefing Question

- How did graphing the function help you determine the validity of the statements?

Communicating about Mathematics

Students may respond by recording a written response in the space provided or by talking to a partner.

Possible sentence frame:
I can determine the zeros of a piecewise function by _____.

Listen For . . .

Understanding of how to determine the zeros of each part of a piecewise function from its related equation and domain values.

Debriefing questions are included to assist the teacher with facilitating a post-activity

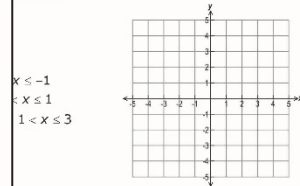
Listen For . . .

- Use of vocabulary, such as closed interval, open interval, domain, range, symmetry, x-intercept, y-intercept, and zero.
- Connections between the expressions and the related domain values.

Date: _____

Piecewise Features

Describe the piecewise function, f , by writing statements. Read accurately. Check the box if the statement is accurate. Edit accurately.



Statements

real number

- The range of the function is all real number
- The function is constant on the interval $(-1$
- The y-intercept of the graph of the function
- The function is decreasing on the interval $($
- The function is increasing on the interval $(-$
- The function has two zeros, when $x = -3$ and when $x = 1$.
- The graph is not symmetric about the origin.



Each activity includes an opportunity for students to articulate and summarize their own learning. A sentence frame is provided for students who may need language support.

Key learning outcomes from the debriefing discussion are summarized here.

Key learning outcomes from the Communicating about Mathematics section are included here.

Communicating about Mathematics

How can you determine the zero(s) of a piecewise function when given the equations and their domains?

 _____
 _____

Fly Advertisement

Take turns with your partner choosing a box to complete. Discuss your response with your partner. Continue until all boxes have been completed.

The Fly Advertisement Company prints and assembles aerial banners. The first table shows f , the function which can be used to determine the amount of nylon needed based on ℓ , the length of the banner. The second table shows g , the function which can be used to determine the time needed to print and assemble an aerial banner based on m , the amount of nylon used.

Area of Nylon Banners

Length Banner, ℓ (feet)	50	75	100	125	150	175	200	225	250
Nylon, $f(\ell)$ (square feet)	750	1125	1500	1875	2250	2625	3000	3375	3750

Time to Print and Assemble Banners

Nylon, m (square feet)	800	970	1150	1500	2200	2250	2900	3750	4500
Time, $g(m)$ (hours)	12	14.55	17.25	22.5	33	33.75	43.5	56.25	67.5

<p>A</p> <p>What does $f(75) = 1125$ represent in the context of this situation?</p>	<p>B</p> <p>How do you know it will take 22.5 hours to print a banner that is 100 feet long?</p>	<p>C</p> <p>Estimate the production time for a banner that is 180 feet in length.</p>
<p>D</p> <p>Estimate the length of banner that takes 43.5 hours to print and assemble.</p>	<p>E</p> <p>Represent the production time for a banner 250 feet in length using a composite function.</p>	<p>F</p> <p>Evaluate $g(f(100))$.</p>
<p>G</p> <p>What is the production time for a banner that is 150 feet long?</p>	<p>H</p> <p>What does $g(2200) = 33$ represent in the context of this situation?</p>	<p>I</p> <p>How do you know a banner that takes 56.25 hours to print and assemble is 250 feet long?</p>

Communicating about Mathematics

How does the composed function $g(f(\ell))$ help you relate the context to the questions asked?