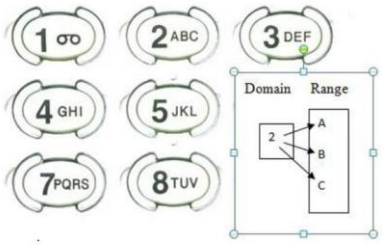
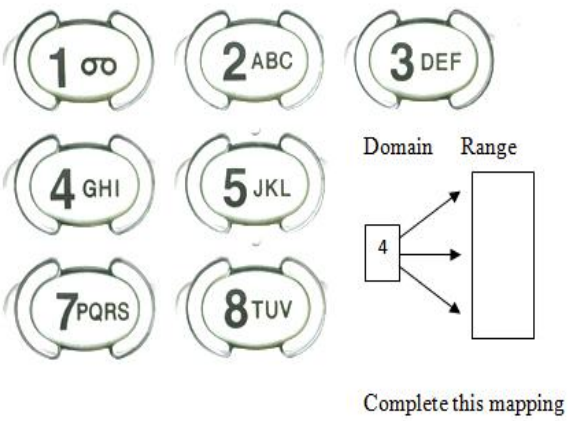
Relations and Functions

Name: Date: Period:

Slide 1
Relations and Functions • A **relation** is a pairing of input values with output values. It can be shown as a set of order pairs (x, y), where x is the input and y is the output. • • The set of input values for a relation is called the **domain**, and the set of output values is called the **range**.

Slide 2
Relations 

Slide 3 - Text Response	Your Response
 Complete this mapping	

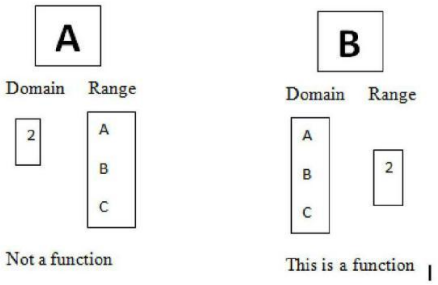
Slide 4

Functions

- A relation in which the first coordinate is never repeated is called a *function*.
- In a **function**, there is only one output for each input, so each element of the domain is mapped to exactly one element in the range.
- In other words, for every x, there is only 1 y.

Slide 5

Functions



Slide 6

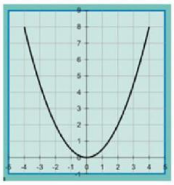
Functions

- Linear Function: $y = mx + b$
  $ax + by = c$
- Nonlinear Functions: Equations
  $f(x) = x^2$
  $f(x) = x^3$
  $f(x) = x^m$

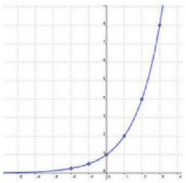
Slide 7

Nonlinear Functions: Graphs

Quadratic



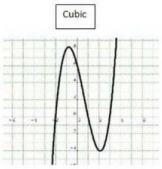
Exponential



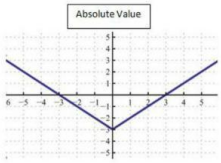
Slide 8

Nonlinear Functions: Graphs

Cubic



Absolute Value



Slide 9

Nonlinear Functions: Tables of Values

x	$f(x)$
- 4	- 10
- 2	- 8
0	- 6
2	- 4
4	- 2

Table 1

x	$f(x)$
- 4	16
- 2	4
0	0
2	4
4	16

Table 2

x	$f(x)$
- 4	- 8
- 2	- 4
0	0
2	4
4	8

Table 3

x	$f(x)$
- 4	- 1
- 2	1
0	3
2	5
4	7

Table 4

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Nonlinear Functions: Tables of Values

x	0	2	4	6
y	0	2	8	18

x	y
1	1
2	3
3	6
4	10

Slide 11 - Text Response

Your Response

With partner, discuss the following situations.

Functions or Non-Functions

Example 2 Determining Whether a Relation is a Function
Determine whether each relation is a function

A

Instant Rice Cooking Time				
Servings	2	4	6	8
Cooking time (min)	5	8	10	11

B
From last name to Social Security No.

Slide 12

Vertical-line Test

- When given a graph, we can perform a *vertical-line test* to determine if the graph of relation is a function.
- **Vertical-line test,** if any vertical line passes through more than one point on the graph of a relation, the relation is not a function.

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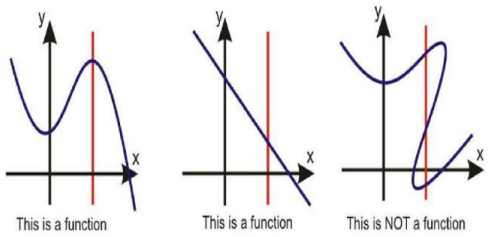
Vertical-line Test



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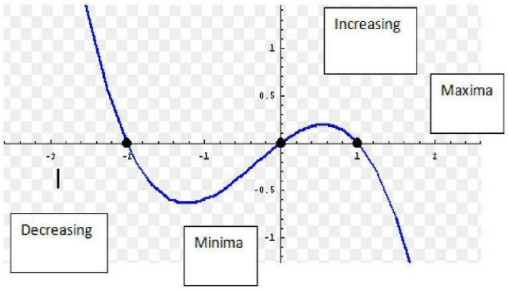
Features of Functions



Slide 15

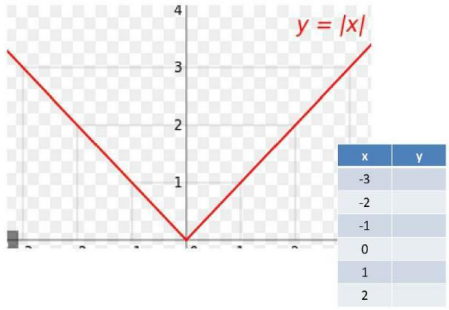
Functions: Continuous or Discontinuous

- The graph of a **continuous function** can be drawn without lifting the pencil from the paper.
- The graph has a gap, then it is a discontinuous function.

Slide 16 - Drawing	Your Response
With a partner, draw and label a continuous and a discontinuous function	

Slide 17

Absolute Value Function



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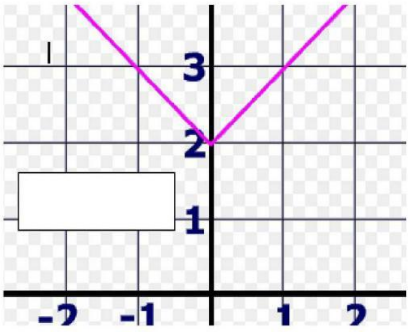
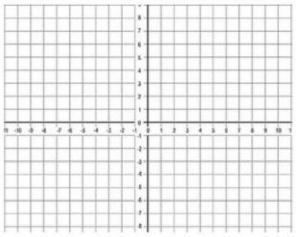
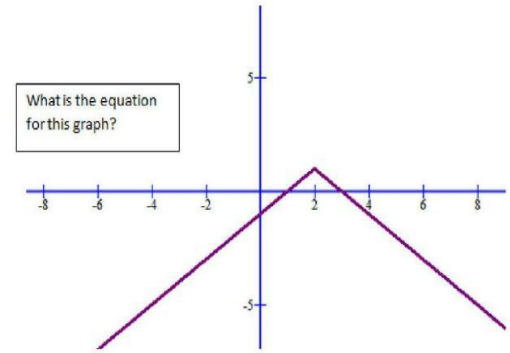
Absolute Value Function



Slide 19
Absolute Value Function f(x) = |x − 2| f(x) = |x + 2| f(x) = - |x| f(x) = a|x + b| + c 

Slide 20 - Website	URL
With a partner, create an absolute value equation and graph it on paper and confirm it by using desmos.	

Slide 21 - Text Response	Your Response
Absolute Value Function 	

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Solving Absolute Equations

- Absolute value is a non-negative real number.
- Absolute equation has 2 possible solutions.

  Case 1: $|x| = x$

  Case 2: $|x| = -x$

Example

- $|3| = 3$
- $|3| = -3$

Slide 23 - Text Response	Your Response
Solve it and compare your solutions with your a classmate. Solving Absolute Value Equations $\|3x\| = 9$ $\quad\quad$ $\|7x\| = 21$ Case 1: $3x = 9$ $\quad\quad$ Case 1: Case 2: $3x = -9$ $\quad\quad$ Case 2:	

Slide 24 - Text Response	Your Response
Solve it and compare your solutions with your a classmate. Solving Absolute Value Equations $\|-2r - 1\| = 11$ $\quad\quad$ $\|1 - 5a\| = 29$	

Slide 25 - Text Response	Your Response
Solve it and compare your solutions with your a classmate. Solving Absolute Value Equations $5-8\lvert -2n\rvert = -75$ $3\lvert -8x\rvert + 8 = 80$	

Slide 26 - Text Response	Your Response
With a partner, create an absolute value equation and solve it. Post your answer and record it on the note.	

Slide 27
Absolute Value Equations • **Absolute value is always positive (or zero).** • An equation such as $\lvert x-4\rvert = -6$ is never true. It has NO solution. The answer is the empty set.

Slide 28

With a partner, create an absolute value equation that has no solution. Post your equation and record it on your note.

Slide 29

Solve it and compare your solutions with your a classmate.

Solving Absolute Inequalities

$|6+9x| \leq 24$ $|10p-4| < 34$

Slide 30

Solve it and compare your solutions with your a classmate.

Solving Absolute Inequalities

$|-8a-3| > 11$ $|1-4k| \geq -11$

Slide 31
Absolute Inequalities: Word Problems **Example** • The ideal width of the conveyor belt for a manufacturing plant is 51 inches. The actual width of the conveyor belt may vary from the ideal width by at most 7/32 in. Find the range of the acceptable widths for the conveyor belt.

Slide 32 - Text Response	Your Response
Solve it and compare your solutions with your a classmate. Absolute Inequalities: Word Problems • The ideal weight of one type of model airplane is 33.86 ounces. The actual weight may vary from the ideal weight by at most is .05 ounce. Find the range of the acceptable weight for this engine.	

Manufacturing The ideal diameter of a piston for one type of car engine is 90.000 mm. The actual diameter can vary from the ideal by at most 0.008 mm. Find the range of acceptable diameters for the piston.