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| **Functions (2.1)** | **Math 098** |

Overview: Functions are used to show a relationship between two quantities. We will represent functions with words, tables, symbols, and graphs. Not all relationships can be considered functions however.

Function – a relationship between two sets of quantities, where

The Input –

The Output –

Function Notation –

A picture:

Wages Example –

Example 1: Is it a Function?

1. Input $1 to Quarter (25¢) Change Machine (what’s the output?)

vs.

Input $1 into Slot Machine (what’s the output?)

|  |  |
| --- | --- |
| Input – Baseball Team | Output – Baseball City |
|  |  |

|  |  |
| --- | --- |
| Input – Baseball City | Output – Baseball Team |
|  |  |

We need to be able to:

* Decide if a relationship is a function
* Evaluate a function
* Determine what numbers or values are allowed as inputs (Domain)
* Determine what numbers or values can result as outputs (Range)

Example 2: For each of the examples in the table below, state whether the table, graph, or words do or do not describe a functional relationship. If it does not, provide an explanation or circle the features you used to make your decision.

|  |  |  |
| --- | --- | --- |
| Tables | Graphs | Words |
| |  |  | | --- | --- | | *t* | *C* | | 1 | 1 | | 2 | 4 | | 3 | 9 | | 4 | 16 | | 5 | 25 |   Is *C* a function of *t*? |  | * 1. Is the amount you pay your babysitter for an evening out a function of the time you are gone if she charges $6 an hour? |
| |  |  | | --- | --- | | *t* | *C* | | 15 | 100 | | 30 | 200 | | 45 | 100 | | 0 | 150 | | 15 | 100 |   Is *C* a function of *t*? | **5**  **-5**  **5**  **-5**  Does this graph show *y* as a function of *x*? | * 1. Is the amount you are charged in sales tax a function of the cost of a taxable item purchased in Seattle? |
| |  |  | | --- | --- | | *y* | *x* | | – 3 | 5 | | – 2 | 6 | | 0 | 7 | | –3 | 8 | | 1 | 9 |   Is *x* a function of *y*?  Is *y* a function of *x*? | **5**  **-5**  **5**  **-5**  Does this graph show *y* as a function of *x*? | * 1. Is the amount you are charged in federal income taxes a function of the amount you earn? |

Vertical Line Test –

Evaluating Functions - The first step is being able to read and interpret the symbols in the name of a function.



Example 3: In the following examples, use the tables, graphs, and symbols to evaluate the given functions.

|  |  |  |
| --- | --- | --- |
| Tables | Graphs | Symbols |
| |  |  | | --- | --- | | *n* | *p*(*n*) | | 6 | 21 | | –1 | 6 | | 2 | 13.5 | | 0 | 9 | | –4 | –1 |  * Compute * Find * Find *n* such that *p(n)*=13.5 | ***H*(*x)***  **5**  **-5**  **5**  **-5**   * Compute * What is * For what values of *x* is *H(x)=5* | * 1. If , * Compute * Evaluate  at *r* = 8 * Find |

Objective: Identifying domains and ranges of various functions

Example 4: Determine the domain and range of each of the following functions. Write your answers using interval notation.

|  |  |
| --- | --- |
| **5**  **-5**  **5**  **-5**  Domain:  Range: | **5**  **-5**  **5**  **-5**  Domain:  Range: |
| **5**  **-5**  **5**  **-5**  Domain:  Range: | **5**  **-5**  **5**  **-5**  Domain:  Range: |
| **5**  **-5**  **5**  **-5**  Domain:  Range: | **5**  **-5**  **5**  **-5**  Domain:  Range: |

Example 5: Determine the domain and range of functions given in tables, graphs, and symbols to evaluate the given functions.

|  |  |  |
| --- | --- | --- |
| Tables | Graphs | Symbols |
| |  |  | | --- | --- | | *h* | *W* | | 37 | 592 | | 42 | 672 | | 37 | 592 | | 35 | 560 | | 48 | 768 |   For the function *W*(*h*), use set notation to list its  Domain:  Range: | **5**  **-5**  **5**  **-5**  For the function *f*(*x*) shown above, use interval notation to describe its  Domain:  Range: | * 1. For the function , use interval notation to describe its   Domain:  Range: |

A ZERO of a function means that:

**5**

**-5**

**5**

**-5**

Example 6: Find the zeros of functions.

a) 

**5**

**-5**

**5**

**-5**

b)