**Grade 11 Review – Functions and their Notation**

Function - a relation for which each value of the independent variable corresponds to, at most, one value of the dependent variable. If x and y are two variables, then for each value of x, there is at most one value of y that corresponds with x. Another way of defining a function is to use a graph. For a function that is a relation, a vertical line will never cross more than one point on the plotted graph.

Example 1

Determine which if the following relationships are functions

|  |  |
| --- | --- |
| x | y |
| 3 | 1 |
| 5 | 2 |
| 5 | 6 |
| 7 | 7 |
| 9 | 11 |

 a) x2 + y2 = 25 b) $y=\sqrt{2x-6}$ c)

**Function Notation**

The notation f(x) can be used to define any function. If the input variable x in f(x) is replaced by some value then the replacement must also occur for every other instance of x in the equation.

Example 2

1. Evaluate the following given f(x) = x2 - 3x + 1

a) f(4) b) f(-2)

The independent variable in a function is not restricted to only being replaced by a numerical value; it can also be replaced by an expression or even another function.

Example 3

2. Expand and simplify the following given f(x) = 2x2 + 1 and g(x) = 2x -3

a) f(x - 3) b) g(x + 5) c) g(f(x))

Functions can be embedded or combined with other functions.

Example 4

Simplify the following equations given f(x) = 5x + 7

a) y = 3f(x + 2) – 8 b) 

Equivalent functions can also be used to solve for a variable.

Example 5

If f(x) = 2x + 5, g(x) = x2 – 3x - 5 and f(m + 3) = g(m + 1) solve for m…

Functions can have multiple inputs but must only have one output.

Example 6 - Extension

If f(x, y, z) = 2xy + z2 - x, evaluate the following:

a) f(1, 3, 5) b) f(-3, 2, -4)

Practice

1. Determine which of the following relations are functions.

a) 2x2 + y = 8 b) {(1, 3),(5, 3),(-2, 4),(8, 6),(3, 9),(-5, 4),(2, 5),(7, 2)} c) y2 = 4x - 9

2. Evaluate the following given f(x) = 2x2 – 5x + 6 and g(x) = 5x – 8…

a) f(2) b) f(-5) c) g(9) d) f(2) - g(8)

3. Expand and simplify the following given f(x) = x2 – 4x – 12 and g(x) = 2x + 5…

a) f(x - 1) b) g(x2 + 3) c) f(g(x)) d) g(g(g(x)))

4. Simplify the following equations given f(x) = x2 – 5x – 18…

a) y = 2f(x+3) – 5 b) y = [f(x + 1)+ 3x + 18]2 c) 

5. Solve the following equations if f(x) = x2 + 4x – 8 and g(x) = 2x + 6

a) f(a + 2) = g(a + 2) + 1 b) f(n) = 2g(n)

6. Given h(x) = 4x2 + 10, create any two functions f(x) and g(x) such that h(x) = f(g(x)).

7. Challenge: Create one set of functions f(x) and g(x) such that each statement is true and one set such that each statement is false.

a) f(g(x))=g(f(x)) b) f(a - 2) = f(a) – f(2) ; no need for g(x) here

Solutions

1a) yes; it’s a quadratic, b) yes; no repeat of x values, c) no; isolating for y results in +/-

2a) 4, b) 81, c) 37, d) -28, 3a) x2 – 6x – 7, b) 2x2 + 11, c) 4x2 + 12x - 7, d) 8x + 35

4a) y = 2x2 + 2x – 53 b) y = x4 – 8x2 + 16 c) IROC 2x + h – 5, 

5a) a = 1 or -7 b) 

6. There are multiple answers… a) f(x) = 4x + 10, g(x) = x2 or f(x) = 2x, g(x) = 2x2 + 5

7. Answers vary…

a) True 🡪 f(x) = 5x, g(x) = 2x False 🡪 f(x) = x2, g(x) = 2x

b) True 🡪 f(x) = 4x False 🡪 f(x) = 4x - 2