Mathematics I – Performance Task

Composing Functions

Option #1 Performance Task |
Student Document

Authors: Initiative Team

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Directions

Please review the task below and answer the various questions within the task to the best of your ability. If needed, you may have an adult or peer read the task out loud to aid your understanding. Additionally, feel free to use the following resources in answering each item:

* text-to-speech software
* speech-to-text software
* scratch paper
*

PART 1. Build and Explore New Functions

Composing Functions

Item 1 – Directions

Item 1 has no sub-items. Complete the task below.

Item 1 Task

What is the effect on the graph of a function $f(x)$ when it is replaced by $f(x)+k$, $kf\left(x\right),  f(kx) or f(x+k)$?

For instance, consider a function such as $f(x)=x^{2}$ and the various functions if $k=3$ including

$$g(x)=(x+3)^{2}$$

$$k(x)=3x^{2}$$

$$m(x)=(3x)^{2}$$

$$p(x)=x^{2}+3$$

$$q(x)=x^{2}-3$$

What other equations are possible?

Use the technology of your choice, such as Desmos, a graphing calculator, or an online graphing tool, to determine what the effect on the graph of the function $f(x)=x^{2}$ is based on the change to the equation and why that effect occurs.

Use this example or other examples you create to answer, “What is the effect on the graph of a function $f(x)$ when it is replaced by $f(x)+k$, $kf(x), f(kx) or f(x+k)$?”

PART 2. Sequences

The Fibonacci Sequence

The Fibonacci sequence is arguably the most recognized in mathematics. The sequence was first described over 2,000 years ago and it appears in nature in places like how artichokes flower or with pine cone arrangements. The Fibonacci sequence can be described as a sequence in which each number is the sum of the preceding two numbers, with 0 and 1 as the first two numbers. Mathematically, the Fibonacci sequence can be defined recursively as
*F0* = 0, *F1*= 1, and *Fn* = *Fn*– 1 + *Fn*− 2 for $n ≻ 1.$

Item 1 – Directions

Item 1 has no sub-items. Please complete the task below.

Item 1 Task

Fill in table 1 below for Fibonacci’s sequence. The term number is the subscript, and each number in the sequence is called a term.

Table 1. Fibonacci’s Sequence 1

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Term Number | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Term | 0 | 1 | 1 | 2 | 3 | 5 |  |  |  |  |  |

Item 2 – Directions

Item 2 has no sub-items. Complete the task below.

Item 2 Task

Consider this sequence which is defined recursively as

*a*0 = 3; *an* = 2 • *an –*1

The term number is the subscript, and each number in the sequence is called a term.

Fill in table 2 below.

Table 2. Fibonacci’s Sequence 2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Term Number | 0 | 1 | 2 | 3 | 4 | 5 |
| Term |  |  |  |  |  |  |

If the term number is *x* and the term is *y*, what type of function would this be and what equation would define this function?