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CISP - 440

Assignment 9

11/15/2018

Part 0 - Functions.

Description:

The goal for this assignment is to demonstrate my knowledge in certain function types. In this assignment I am to demonstrate my ability to test if a relation is a function and determine its domain and range. In addition, I am expected to be able to determine if a function is one to one and/or onto.

Problem 5:

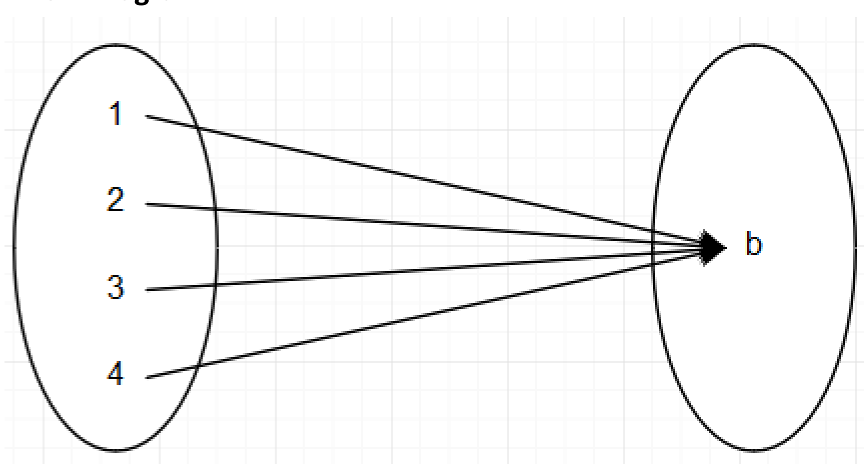
Determine whether each relation is a function given X = {1,2,3,4} to Y= {a, b, c, d}. If it is a function, find its domain and range, draws its arrow diagram, and determine if it is one to one or onto. If it is both one to one and onto, give the description of the inverse function as a set of ordered pairs and draw its arrow diagram, and give the domain and range of the inverse function.

F = {(1, b), (2, b), (3, b), (4, b)}

This above relation is a function. This is because it is both robust (can handle entire domain) and deterministic (same answer every time).

Domain = (1, 2, 3, 4)
Range = (b)

Arrow Diagram



This function is NOT 1 to 1 since pairs exist in the second element.

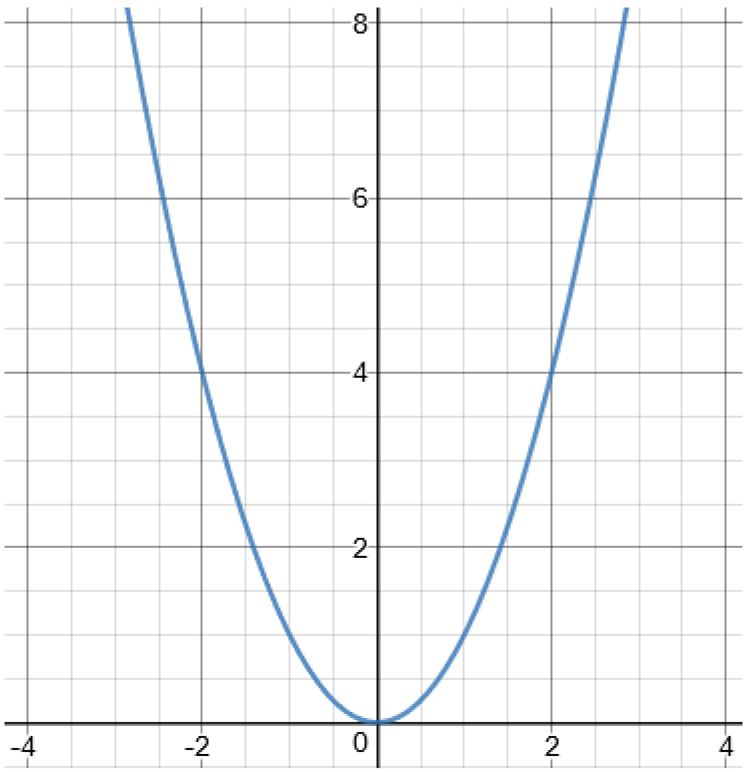
This function is NOT onto because the entire range of Y is not covered.

Problem 8:

Draw the graph of the function.

F(x) = X^2

Graph of function (parabola centered at origin)



Problem 15:

Determine whether the function is one to one. The domain is the set of all real numbers. If the function is not one to one exhibit distinct numbers A and B with F(a) = F(b). Also, determine whether the function is onto the set of all real numbers. If the function is not onto, exhibit a number Y for which F(x) != Y for all real X.

$$F(x) = \frac{X}{1+x^2}$$

This function is one to one. This is because for every value of X that we plug in we will get a different value for Y. This value will not repeat and thus each Y will be unique to that X.

This function is NOT onto. This is because the function does not cover the entire range. For example if we plug in X = 0, we will get Y = 0. If we plug in X = 1, we will get Y = ½. If we plug in X = 2, we will get Y = ⅔. Values such as Y = 2, 3, 4... will never be created.

Fun fact: As X increases Y will head to 0.

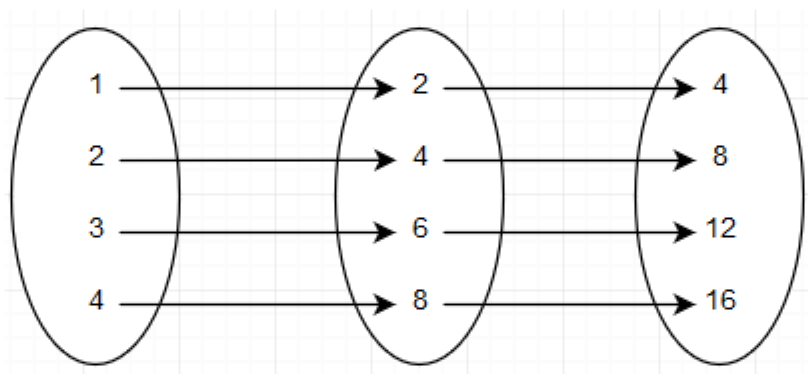
Problem 28:

Let F and G be functions from the positive real numbers to the positive real numbers defined by the equation. Find the compositions: F o F, G o G, F o G, G o F.

F(x) = 2X   G(x) = X^2

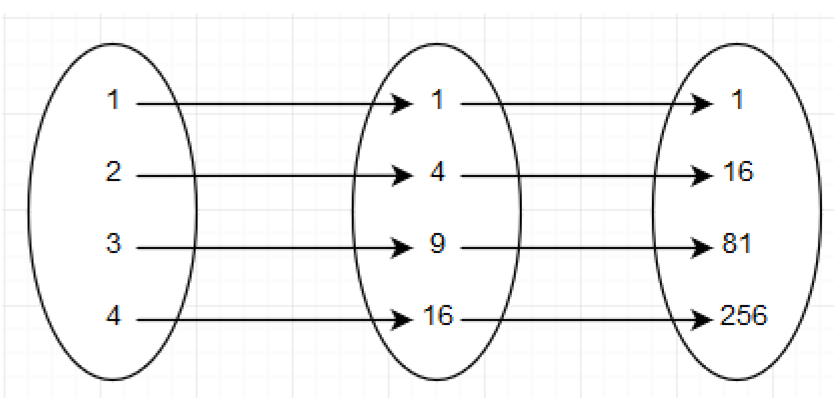
Note: For simplicity's sake, the positive real numbers 1-4 will be used to demonstrate the compositions.

F o F



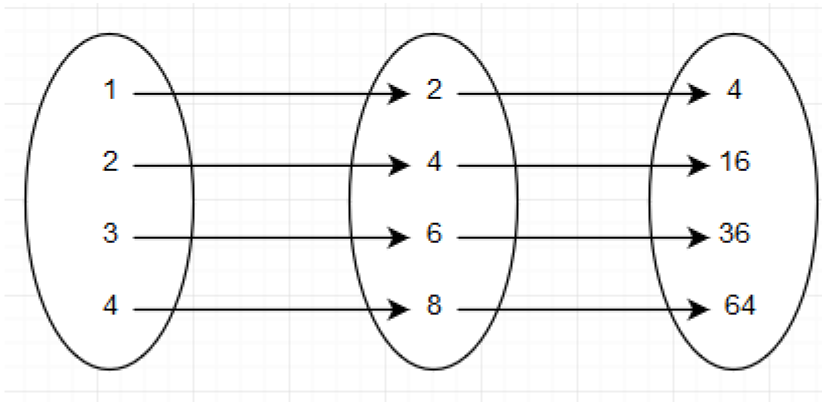
F o F = {(1, 4), (2, 8), (3, 12), (4, 16)...}

G o G



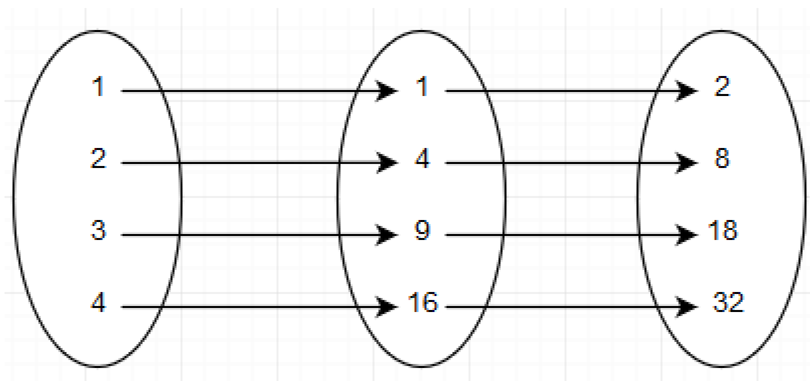
G o G = {(1, 1), (2, 16), (3, 81), (4, 256)...}

F o G



F o G = {(1, 4), (2, 16), (3, 36), (4, 64)...}

G o F



G o F = {(1, 2), (2, 8), (3, 18), (4, 32)...}

Problem 36:

How many functions are there from {1, 2} into {a, b}? Which are one to one? Which are onto?

There are a total of 4 functions possible. Those being…

F0 = {(1, a), (2, a)}
F1 = {(1, b), (2, b)}
F2 = {(1, a), (2, b)}
F3 = {(1, b), (2, a)}

Functions F2 and F3 are one to one. This is because no two pairs share the same second element.

Functions F2 and F3 are onto. This is because the entire range (a, b) is covered in both of these functions.

Conclusion

This assignment was pretty straightforward. The concept of functions with relations in mind is extremely similar to the mathematical functions we learned in Pre Calc. Looking forward to when we get to right some more code!