Math 120 Quiz #3 Oct. 4, 2010

Problem 1

Consider the function

$$f(x) = \frac{\sqrt{x+3}}{x-1}$$

Problem 1.a

If the graph of this function looks like Figure 1,



Figure 1: Graph of f(x) on a subdomain

what is the name of the graphical test that confirms f(x) is a function?

Solution

The vertical line test.

Problem 1.b

What is the domain of this function?

Solution

To determine the domain, you need to not divide by zero or take the square root of a negative number. First we check dividing by zero:

$$\begin{array}{c} x - 1 \neq 0, \\ x \neq 1 \end{array}$$

then we check the square root term

$$\begin{aligned} x+3 &> 0\\ x &> -3. \end{aligned}$$

These two combined issues gives us the domain x > 3 and $x \neq 1$.

Problem 1.c

Evaluate this function at the following points:

$$f(0) f(2) f(x+h)$$

Solution

$$f(0) = \frac{\sqrt{0+3}}{0-1} = -\sqrt{3}$$
$$f(2) = \frac{\sqrt{2+3}}{2-1} = \sqrt{5}$$
$$f(x+h) = \frac{\sqrt{x+h+3}}{x+h-1}$$

Problem 2

Suppose you have two functions,

and

g(x) = x - 1

 $f(x) = x^2$

Determine the following combinations of these functions

Problem 2.a

(f+g)(x)

Solution

$$(f+g)(x) = f(x) + g(x)$$
$$= x^2 + x - 1$$

Problem 2.b

(fg)(x)

Solution

$$(fg)(x) = f(x)g(x)$$
$$= x^2(x-1)$$

Problem 2.c

f(g(x))

Solution

$$(f(g(x)) = f(x - 1))$$

= $(x - 1)^2$