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Graphing Rational Functions Notes

Function:

The function is a relation such that no two ordered pairs have the same first element. A function may be denoted as y = f(x) which is read "f of x". A function may be written as f: x → y, where x ϵ domain while y ϵ range.

Sample Problem 1: Find the Range of the following rational function.

1. If $f(b)=\frac{b-b^2}{1+b^2}$, find a. $f\left(-\frac{1}{2}\right)$; b. $f(-2)$; c. f(-1).

$$a. \frac{\left(-\frac{1}{2}\right)-\left(-\frac{1}{2}\right)^2}{1+\left(-\frac{1}{2}\right)^2}=\frac{-\frac{3}{4}}{\frac{5}{4}}=-\frac{3}{4}\times\frac{4}{5}=-\frac{12}{20}=-\frac{3}{5}$$

$$b. \frac{(-2)-(-2)^2}{1+(-2)^2}=\frac{-2-4}{1+4}=\frac{-6}{5}=-1\frac{1}{5}$$

$$c. \frac{(-1)-(-1)^2}{1+(-1)^2}=\frac{-1-1}{1+1}=\frac{-2}{2}=-1$$

Sample Problem 2: Draw the graph of the following rational function.

2. Below is the table containing the domain of f(x) =$\frac{x}{2}$, find f(x) given the value of x below and graph its function.

X	-2	-1	0	1	2	3
Y	-1	-1/2	0	1/2	1	3/2

$f(-2)=\frac{-2}{2}=-1$ $f(-1)=\frac{-1}{2}$ $f(0)=\frac{0}{2}=0$ $f(1)=\frac{1}{2}$ $f(2)=\frac{2}{2}=1$ $f(3)=\frac{3}{2}$

Plot the points then draw the graph.

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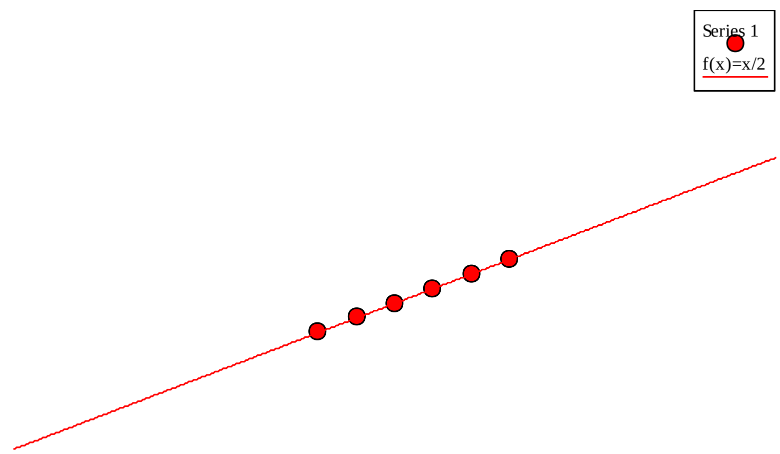
Graphing Rational Functions Notes

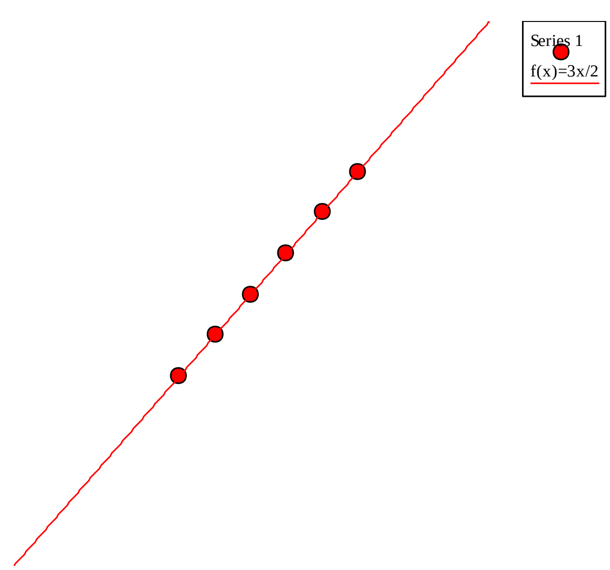


3. Below is the table containing the domain of f(x) =$\frac{3x}{2}$, find f(x) given the value of x below and graph its function.

X	-2	-1	0	1	2	3
Y	-3	-3/2	0	3/2	3	9/2

$$f(-2)=\frac{3(-2)}{2}=-3 \quad f(-1)=\frac{3(-1)}{2}=\frac{-3}{2} \quad f(0)=\frac{3(0)}{2}=0 \quad f(1)=\frac{3(1)}{2}=\frac{3}{2} \quad f(2)=\frac{3(2)}{2}=3 \quad f(3)=\frac{3(3)}{2}=\frac{9}{2}$$

Plot the points then draw the graph.



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Graphing Rational Functions Notes

Graph of Rational Function

The line x = a is a vertical asymptote if the graph increases or decreases without bound on one or both side of the line as x closer to closer to x= a.

The line y=b is a horizontal asymptote if the graph approaches y=b as x increases or decreases without bound. Note that it doesn't have to approach y=b as both increases and decreases. it only need to approach it on one side in order for it to be a horizontal asymptote.

1. The graph will have a vertical asymptote at $x = a$ if the denominator is zero at $x = a$ and the numerator isn't zero at x=a.
2. If n<m then x axis is the horizontal asymptote.
3. If n=m then the line y= a/b is the horizontal asymptote.
4. If n>m there will be no horizontal asymptote.

$$f(x)=\frac{ax^n+\ldots}{bx^2+\ldots}$$

Sample Problem 3: Draw the graph of the following rational function.

4. Sketch the graph of a function $f(x)=\frac{3x+1}{2x-1}$

Y-Intercept

$$f(0)=\frac{3(0)+1}{2(0)-1}=-1$$

X- Intercept

$$3x+1=0 \qquad x=-\frac{1}{3}$$

Asymptote

$$2x-1=0 \qquad x=\frac{1}{2}$$

Horizontal asymptote

$$a=3, b=2 \qquad y=\frac{a}{b}=\frac{3}{2}$$

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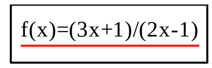
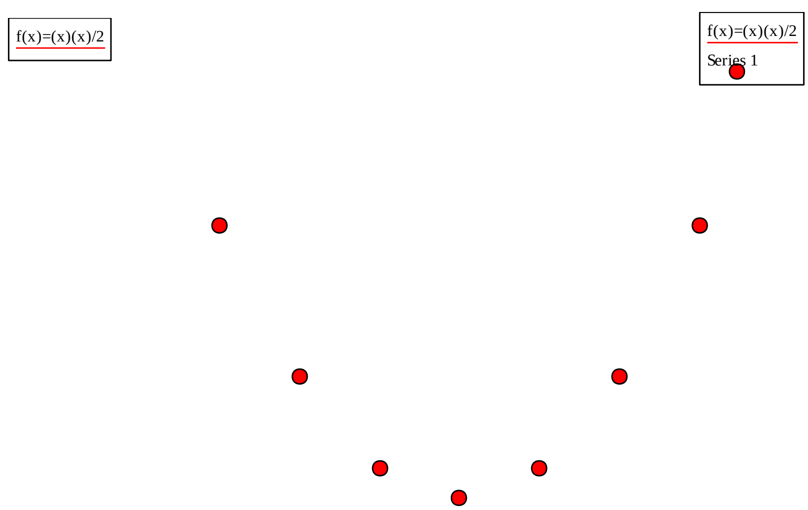
Graphing Rational Functions Notes



Sample Problem 4: Identify the function and the range of the following graph.

5. Find the domain and range of the graph below.



Ordered pair :{(-3, 9/2), (-2, 2), (-1, 1/2), (0, 0), (1, 1/2), (2, 2), (3, 9/2)}

Domain: {.......-3, -2, -1, 0, 1, 2, 3 ...} all positive and negative real numbers

Range: {0, 1/2, 2, 9/2 ...} all positive real numbers

