Review

Given the rational function

$$f(x) = \frac{x(x-4)(x+2)}{(x-2)(x-6)}$$

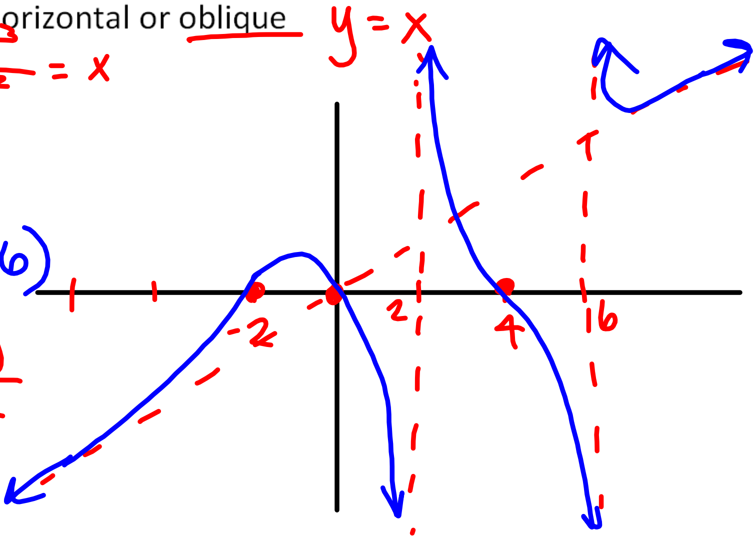
Determine the zeros of the function. 0, 4, -2

Determine the y-intercept of the function. (0, 0)

Determine the equations of any vertical asymptotes of the function. x = 2 , x = 6

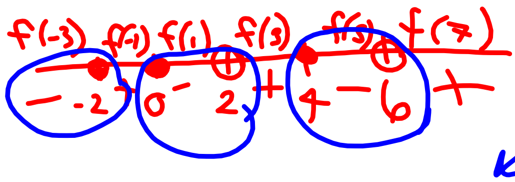
Determine the equations of any horizontal or oblique asymptotes of the function. $\frac{x^3}{x^2} = x$ y = x

Graph the function.



Solve $\frac{x(x-4)(x+2)}{(x-2)(x-6)} \le 0$

$(-\infty, -2] \cup [0, 2) \cup [4, 6)$



10.1 Sequences and Series

8. $a_n = (-1)^{n-1}(3n-5)$

alternating sequence

$(-1)^n$

$a_1 = (-1)^{1-1}(3\cdot 1-5) = \boxed{-2}$

$a_2 = (-1)^{2-1}(3\cdot 2-5) = \boxed{-1}$

$a_3 = (-1)^{3-1}(3\cdot 3-5) = \boxed{4}$

$a_4 = (-1)^{4-1}(3\cdot 4-5) = \boxed{-7}$

$a_5 = (-1)^{5-1}(3\cdot 5-5) = \boxed{10}$

$$a_n = \left(1 + \frac{1}{n}\right)^n \to e$$

what is the n^{th} term?

26. $-2, 3, 8, 13, 18, \ldots$

$n=1$ $n=2$ $n=3$ $n=4$ $n=5$

$$a_n = 5n - 7$$

$\{5n\} = 5, 10, 15, 20, 25, \ldots$

32. $\ln e^2, \ln e^3, \ln e^4, \ln e^5, \ldots$

$n=1$ $n=2$ $n=3$ $n=4$

$$a_n = \boxed{\ln e^{n+1}} = \boxed{n+1}$$

write sigma notation. $\sum_{i=1}^{n} a_i$

56. $7+14+21+28+35+\ldots$

$7\cdot1 \quad 7\cdot2 \quad 7\cdot3 \quad 7\cdot4 \quad 7\cdot5$

$a_n = 7n$

$= \sum_{i=1}^{\infty} 7i = \sum_{n=1}^{\infty} 7n$

$x+2,\ x+3,\ x+4,\ x+5,\ \ldots$

$= \sum_{i=1}^{\infty} x+(i+1)$

60. $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+\frac{1}{4^2}+\frac{1}{5^2}$

$= \sum_{i=1}^{5} \frac{1}{i^2}$

62. $9-16+25+\ldots+(-1)^{n+1}n^2$

$$=\sum_{i=3}^{n}(-1)^{i+1}i^2$$

64.

$$\frac{1}{1\cdot 2^2}+\frac{1}{2\cdot 3^2}+\frac{1}{3\cdot 4^2}+\frac{1}{4\cdot 5^2}+\ldots$$

$i=1$ $i=2$ $i=3$ $i=4$

$$=\sum_{i=1}^{\infty}\frac{1}{i\cdot(i+1)^2}$$

Arithmetic Sequences/Series:

Definition: A sequence is arithmetic if there exists a number d, called the **common difference**, such that $\boldsymbol{a_{n+1} = a_n + d}$ for any integer $n \geq 1$.

The **nth term** of an arithmetic sequence is given by
$\boldsymbol{a_n = a_1 + (n-1)d}$, for any integer $n \geq 1$.

The **sum of the first n terms** of an arithmetic sequence is given by
$$\boldsymbol{S_n = \frac{n}{2}(a_1 + a_n)}$$

Geometric Sequences/Series:

Definition: A sequence is geometric is there is a number r, called the **common ratio**, such that $\boldsymbol{\frac{a_{n+1}}{a_n} = r}$, or $a_{n+1} = a_n r$, for any integer $n \geq 1$.

The **nth term of a geometric sequence** is given by
$\boldsymbol{a_n = a_1 r^{n-1}}$, for any integer $n \geq 1$.

The **sum of the first n terms** of a geometric sequence is given by
$\boldsymbol{S_n = \frac{a_1(1-r^n)}{1-r}}$, for any $r \neq 1$.

When $|r| < 1$, the **limit or sum of an infinite geometric series** is given by
$$\boldsymbol{S_\infty = \frac{a_1}{1-r}}$$

10.2

Arithmetic Sequences/Series:

Definition: A sequence is arithmetic if there exists a number d, called the **common difference**, such that $\boldsymbol{a_{n+1} = a_n + d}$ for any integer $n \geq 1$.

The **nth term** of an arithmetic sequence is given by
$\boldsymbol{a_n = a_1 + (n-1)d}$, for any integer $n \geq 1$.

The **sum of the first n terms** of an arithmetic sequence is given by
$$\boldsymbol{S_n = \frac{n}{2}(a_1 + a_n)}$$

$-8, -5, -2, 1, 4, \ldots$

common difference: 3

n^{th} term: $a_n = a_1 + (n-1)d$

$a_n = -8 + (n-1) \cdot 3 = -8 + 3n - 3$

$\boxed{a_n = 3n - 11}$

12^{th} term:

$a_{12} = 3(12) - 11 = 36 - 11 = \boxed{25}$

$7, 4, 1, \ldots$

find the 17^{th} term.

$d = -3$

$a_n = a_1 + (n-1)d = 7 + (n-1)(-3)$

$a_{17} = 7 + (17-1)(-3)$

$= 7 + 16(-3)$

$= 7 - 48$

$= \boxed{-41}$

The sum of an arithmetic sequence is called an arithmetic series.

The sum of the first n terms is

$$S_n = \frac{n}{2}(a_1 + a_n) = \sum_{i=1}^{n} a_i$$

$11 + 7 + 3 + \ldots$

$a_n = a_1 + (n-1)d$

$a_{14} = 11 + (14-1)(-4)$

$= 11 + 13(-4)$

$= 11 - 52 = -41$

$S_{14} = \frac{14}{2}(11 + (-41))$

$= 7(-30)$

$= \boxed{-210}$

34. $\sum_{K=5}^{20} 8K = 8\cdot5 + 8\cdot6 + \ldots + 8\cdot20$

1st term

20-5 +1st term

16th term

$\sum_{i=1}^{3} i = 1 + 2 + 3$

3-1 +1st term

$S_n = \frac{n}{2}(a_1 + a_n)$

$S_{16} = \frac{16}{2}(40 + 160)$

$= 8(200) = \boxed{1600}$

HW #9 (due Mon, Oct 20)

solve systems of equations in 2 and 3 variables using a matrix to get a single, integer solution:

- 8.1 #17, 19, 21 (but solve using a matrix)
- 8.3 #27, 31
- 8.2 #3*,7,9 (but solve using a matrix) *eq 3 *should* read: 2x+y+z=-3

HW #10 (due Fri, Oct 24)

- 10.1 #7,9,23-31odd, #59,63,67
- 10.2 #9,15,19,21,25,29,35,37
- 10.3 #15,19,21,25,35,37,43,45,49,57
- 10.7 #1,7,21,27,31-39odd

Due Mon, Oct 27

- Final Exam Practice Problems

Quiz #5 on Matrices, Sequences, Series - Friday 10/24

Final Exam - 9:00am, Friday 10/31