00:00 00

PTT:

1. Pick up your test.
2. Hand in your boxes.
3. Find the vertical asymptotes and/or holes in the function: $\frac{4x}{x^3 - x} = \frac{4x}{x(x^2-1)} = \frac{4\cancel{x}}{\cancel{x}(x+1)(x-1)}$

Domain: $\mathbb{R}, x \neq 1, -1, 0$

V.A.: $x = 1$, $x = -1$

Holes: $(0, -4)$

$\frac{4}{(x+1)(x-1)}$

$= \frac{4}{1 \cdot (-1)} = -4$

Unit 6 - Rational Functions

Week 1 (Nov 19 - 22)

Day 2	T	6-1 & 6-2 Intro to rationals
Day 3	**W/Th**	**6-3 End behaviour**
Day 4	F	Quiz, 6-4 Graphing rationals

Hand out assignment

Week 2 (Nov 25 - 26)

Day 1	M/T	6-5 Graphing rationals part 2	
Day 2	*T*	*IMC day*	*P5 only*

Week 3 (Dec 2 - 6)

Day 1	M/T	6-7 "Putting it all together"	
Day 2	T/W	Unit 6 review	Assignment due
Day 3	Th	UNIT 6 TEST	

Lesson 6-3: End Behaviour pg 143

Objective: To be able to determine the behaviour of rational functions as they approach + or - infinity.

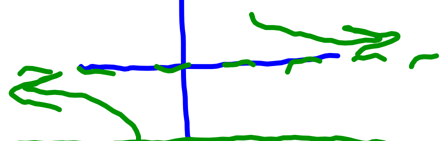
Agenda:

1. PTT
2. Unit overview
3. Lesson 6-3
4. Work time on A6-3

TOPIC: RATIONAL FUNCTIONS AND END BEHAVIOR

Horizontal Asymptotes (HA):

1. $f(x)=\dfrac{3}{2x+4}$ What is the end behavior of f(x)?



x	f(x)
-10	-0.188
-100	-0.015
-1000	-0.002
-10000	-0.000

x	f(x)
10	0.188
100	0.015
1000	0.002
10000	0.000

The line y = c is a <u>horizontal asymptote</u> of f(x) if as $x \to -\infty$ or ∞, $f(x) \to c$.

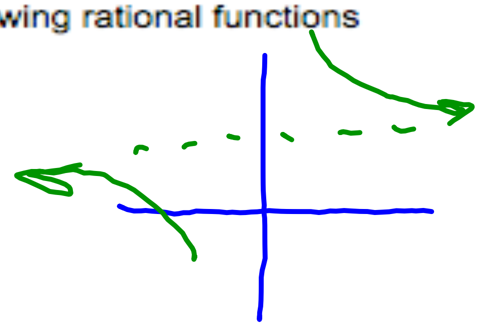
As $x \to -\infty$
$f(x) \to$ 0

As $x \to \infty$
$f(x) \to$ 0

As $x \to -\infty$ or $x \to \infty$, $f(x) \to$ 0.
Conclusion: y=0 is a H.A. of f(x)

Analyze the end behavior of each of the following rational functions and then write in proper rational form.

2. $f(x)=\dfrac{3x}{1x+2}$



x	f(x)
-10	3.75
-100	3.061
-1000	3.006
-10000	3.0006

x	f(x)
10	2.5
100	2.941
1000	2.994
10000	2.9994

As $x \to -\infty$
$f(x) \to 3$

As $x \to \infty$
$f(x) \to 3$

As $x \to -\infty$ or $x \to \infty$, $f(x) \to$ 3.
Conclusion: y=3 is a H.A. of f(x).

Memory Trick for HA: Bobo Botn Eatdc
* Bigger on bottom - zero
* Bigger on top - none
* Exponents are the same - divide coefficients

← look at the degree of top and bottom

- If there are no HA (botn), then factor and cancel (if possible) and graph what is remaining, or use long division to find the slant asymptote. The long division will produce a linear equation (ignore the remainder), which will be the equation of the asymptote.

* You will never have both a HA and an SA together

Slant Asymptote (SA):

3. $f(x)=\frac{x^2-2}{x+2}$ deg 2 / deg 1 → no H.A.

x	f(x)
-10	-12.25
-100	-102
-1000	-1002
-10000	-10002

x	f(x)
10	8.167
100	98.020
1000	998
10000	9998

As $x \to -\infty$
$f(x) \to -\infty$

As $x \to \infty$
$f(x) \to \infty$

Does f(x) have a horizontal asymptote? NO

Graph f(x) and y = x – 2 in the same window. Notice the end behavior of f(x). The line y = x – 2 is called a slant asymptote.

As $x \to -\infty$ or $x \to \infty$, $f(x) \to$ $x-2$.

Conclusion: $y=x-2$ is a S.A.

Determine the end behavior (HA or SA) of the following rational functions. Confirm with your graphing calculator.

4. $f(x)=\frac{-4}{2x+1}$

deg top: 0
deg bottom: 1

BOB O

End Behavior: H.A. y=0

5. $f(x)=\frac{x^2+2x+1}{x-2}$

deg top: 2
deg bottom: 1

BOT N

End Behavior: S.A.

6. $f(x)=\frac{1-4x}{2x+3}$

deg top: 1
deg b: 1

EATS DC
exponents are the same

$-\frac{4}{2}$

End Behavior: H.A. y=-2

7. $f(x)=\frac{x-2}{x^2+2x+1}$

deg top: 1
deg b: 2

BOB O

End Behavior: H.A. y=0

Find the domain, holes, and asymptotes of the following rational functions.

Function	Holes	VA	HA	SA
8. $f(x) = \frac{4x}{x^3 - x}$ $= \frac{4\cancel{x}}{\cancel{x}(x+1)(x-1)}$ Domain: $x \neq 0, \pm 1$	$(0,-4)$ $\frac{4}{(+1)(-1)}$	$x = -1$ $x = +1$	✓ $y = 0$	none
9. $h(x) = \frac{1-3x}{1x+6}$ Domain: $x \neq -6$	NO	$x = -6$ $x+6=0$ $x = -6$	$y = -3$ $\frac{-3}{1}$ $= -3$	NONE
10. $f(x) = \frac{2(x-3)(x+2)\cancel{(x-4)}}{x^2 - 5x + 4}$ $\cancel{(x-4)}(x-1)$ Domain: $x \neq 1, 4$	✓ $x = 4$ $\frac{2(4-3)(4+2)}{(4-1)}$ $= \frac{2 \cdot 1 \cdot 6}{3}$ $= 4$ $(4,4)$	$x = 1$	NONE	YES S.A.

Classwork/homework:

A6-3 - please file tests

Reminders:

Quiz on 6-1 to 6-3 Friday!