**Colorado Technical University**

 **Course:** MATH116 – Foundations for Calculus

**Unit 5 Part 09 Readings: Graphs of Rational Equations**

Graphing rational equations can be tricky

Finding the domain of a rational equation will determine where the function is continuous

Points of discontinuity may be a hole in the graph or an **asymptote** (a point the graph

 approaches)

**Vertical Asymptotes**

A vertical asymptote, when it occurs, describes the behavior of the graph when x is

close to some number c

The graph of a rational function will never intersect a vertical asymptote

The vertical asymptotes of a rational function are located at the real zeros of the

 denominator

**Horizontal Asymptotes**

A horizontal asymptote, when it occurs, describes the end behavior of the graph

The graph of a function **may intersect** a horizontal asymptote (!)

Horizontal asymptotes will happen at the extreme values of x for the rational function

 as x→∞ or x→-∞ (the end behavior)

How to find horizontal asymptotes:

1) Is the degree of the numerator less than the degree of the denominator?

 horizontal asymptote y=0

2) Is the degree of the numerator the same as the degree of the denominator?

 horizontal asymptote: (coeff largest degree num “a”)/(coeff largest degree

 denom “b”

3) Is the degree of the numerator larger than the degree of the denominator?

 no horizontal asymptote

**Oblique Asymptotes**

If, as x→∞ or as x→-∞, the value of a rational function approaches a linear expression

 ax+b, a≠0, then the line y=ax+b is an oblique asymptote of R

An oblique asymptote, when it occurs, also describes the end behavior of the graph

The graph of a function **may intersect** an oblique asymptote

So to find oblique asymptotes, we again need to find the end behavior of the rational

 function as x→∞ or as x→-∞

How to find oblique asymptotes:

3) Is the degree of the numerator 1 larger than the degree of the denominator?

 y = ax + b is an oblique asymptote

 where “a” is the coefficient of the largest degree in the numerator and

 “b” is the coefficient of the largest degree in the denominator

4) Is the degree of the numerator 2 or more larger than the degree of the denominator?

 There is no oblique asymptote

 (or horizontal)

WolframAlpha does these easily and can determine parabolic asymptotes, too!

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