Pre Calc Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_

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WS Assessment

Target 5

Rational function

* Simplify Expression
* Rational Functions / Asymptotes
* Graphing Rational Functions
* Inequalities: Rational and Radicals

HW 5 Rational Functions [www.deltamath.com](http://www.deltamath.com)

Simplify the following expression

4x2 (x – 2)3 + 2x(x – 2)4

If  f(x)  is a rational function given by where P(x) and Q(x) are polynomials, we can use the following information to sketch the graph of *f*

*I) Asymptotes* The value of the coordinates of points on the graph of *f* get arbitrarily large (in absolute value) as the graph approaches an asymptote but it will never crosses the asymptote.

**A. Vertical Asymptotes** To find the vertical asymptotes, we can first cancel any common factors in P(x) and Q(x) then take the vertical lines corresponding to **the zeros of the denominator**:

**B. Horizontal Asymptotes**

We can find the horizontal asymptotes by investigating the behavior of *f (x)* as x gets arbitrarily large (with either a plus sign or a minus sign):

1. If deg (P(x)) < deg Q(x)), then the **line** **y = 0 (x-axis) is the horizontal asymptote** for the graph of *f*.

2. If deg (P(x)) = deg Q(x)), and a and b are the coefficients of the highest powers of x appearing in P(x) and Q(x), respectively, then the **line y = a/b is the horizontal asymptote** for the graph of *f*.

3. If deg (P(x)) > deg Q(x)), then there is **no horizontal asymptote** for the graph of *f*.

**C. Slanted Asymptotes (in place of Horizontal Asymptotes – case #3)**

If deg (P(x)) = deg Q(x)) + 1, then the graph of *f* has a slanted asymptote; and we can find the slanted asymptote by dividing P(x) by Q(x): If P(x)/Q(x) = mx + b + Remainder where deg(Remainder) < deg(Q(x)) then the **line y = mx + b is the slanted asymptote**.

*II) The Intercepts* You know how to find these

*III) Sign Chart* See how it works in the example below

Example: Given find the asymptotes and intercepts, then use this information and a sign chart to sketch the graph. (No calculator yet)

Solution Asymptote → Vertical \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Horizontal \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Intercepts: y-intercept = ? (where x = 0) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

x-intercept = ? (where y = 0) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Sign Chart

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **X = -1 1 2 3** | | | | |
| 0 | |  |  |  |
|  | 0 | |  |  |
|  |  | 0 | |  |
| P(x) |  |  | 0 | |
| Q(x): |  |  |  |  |
| f(x) |  |  |  |  |

Sketch of the graph

For each function below do the following:

Find the asymptotes; Find the intercepts; Make a sign chart;

Determine if the graph of *f* crosses its horizontal asymptote, and if the graph has symmetry around the origin or the y-axis. Then use this information to sketch the graph of *f*

1. 2.

3. 4.

5. 6.

7. 8.

Finding holes of the function. Consider this rational function by simplify it we have

Find the hole of the following function, Write your answer as coordinate point.

Sketch the graph of the following function: (Show all asymptotes, intercepts, sign chart and hole)

Solve the following inequalities and sketch graph (desmos) to verify

Find all values of x for which

**Target 5 Assessment**

Sketch the graph of the following function: (Show all asymptotes, intercepts, sign chart and hole)

Find all values of x for which