**Math 1050- 5.1 Notes:**

|  |  |
| --- | --- |
| Polynomial Function: |  |
| Polynomial Graphs must be: |  |
| The **Power Function of degree** n is a monomial of the form: |  |
| Properties of Power Functions, f(x) = xn, where n is an even integer: | Properties of Power Functions, f(x) = xn, where n is an odd integer: |
| **Examples:** Graphing a Polynomial Function using Transformations: |
| $$f\left(x\right)=1-x^{5}$$GraphPaper20x20AxesUnits.bmp | GraphPaper20x20AxesUnits.bmp$f\left(x\right)=\frac{1}{2}\left(x-1\right)^{4}$ |
| Real Zero: | Turning Points (aka “the action”): |
| Based on the definition of “Real Zero”, the following statements are equivalent: |
| **Examples**: Creating a Polynomial Function from it’s zeros |
| 1. Find a polynomial of degree 3 whose zeros are -3, 2, and 5.
2. Use a graphing utility to graph the polynomial function found in part a to verify your result.
 | 1. Find a polynomial of degree 4 whose zeros are -2, -1 with a multiplicity of 2, and 1.
2. Use a graphing utility to graph the polynomial function found in part a to verify your result.
 |
| Multiplicity (or Multiple Root): |
| If Multiplicity is even: | If Multiplicity is odd: |
| Behavior Near a Zero: | How to find the Behavior Near a Zero: |
| **End Behavior**. For large values of x, either positive or negative, the graph of the polynomial \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ resembles the graph of the power function \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.(See Figure 17)See Example 8 |

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| **Making the Graph of a Polynomial:**Step 1: Find the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Step 2: Determine if the graph will \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ at the real zeros.Step 3: Determine the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (recognize which parent function it will look like).Step 4: Determine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number of turning Points. Step 5: Behavior near each \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \*\*Step 6: Sketch the graph. Be sure to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. |
| **Table Set up for Polynomial and Rational Function:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Intervals (determined by real roots aka \_\_\_\_\_\_\_\_\_\_\_** | #of columns will vary based on the # of Real Roots |  |  |
| **X- value (in each interval)** |  |  |  |
| **Work: Plug in the x-value** |  |  |  |
| **Point on the graph (x,y)** |  |  |  |
| **Location: Above or Below the x-axis** |  |  |  |

 |
| Graph the Polynomial Function:$$f\left(x\right)=x^{3}+x^{2}-12x$$ | Graph the Polynomial Function:$$f\left(x\right)=x^{2}\left(x-4\right)(x+1)$$ |

**5.2 & 5.3 - Properties of Rational Functions**

Rational Functions: Proper Rational Functions:

Improper Rational Functions: Horizontal Asymptote:

Vertical Asymptote: Oblique Asymptote:

\*\*A Rational Function can have one horizontal asymptote or one oblique asymptote **OR** no horizontal or oblique asymptote.

A rational function will \_\_\_\_\_\_\_\_\_\_\_\_ cross or touch a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ asymptote.

A rational function \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cross or touch a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ asymptote.

A rational function \_\_\_\_\_\_\_\_\_\_\_\_­\_\_\_\_ cross or touch a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ asymptote.

**“Unbounded in the negative direction”:**

Vertical Asymptotes:

Make sure that: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The V.A. will occur at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the denominator (meaning the remaining \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Rational functions \_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ have vertical asymptotes.

Examples:

Horizontal or Oblique asymptotes- 4 different situations

* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the numerator is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the degree of the denominator. This is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ rational function. The \_\_\_\_\_\_\_\_\_\_\_\_\_ is the horizontal asymptote. The equation of the line is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the numerator and the denominator are \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the leading co-efficient of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, a, divided by the leading coefficient of the denominator, b. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* The degree of the numerator is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than the degree of the denominator \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is found by dividing the numerator by the denominator. The quotient (after discarding the remainder) is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. This will be a linear equation \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* The degree of the numerator is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than the degree of the denominator by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. There is NO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ asymptote and NO \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ asymptote.

**Examples:**

**Math 1050- 5.3 Lecture Notes**

**Analyzing the Graph of a Rational Function:**

**Step 1:** Find the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 2:** Write R(x) in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Step 3:** Locate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in R(x) = P(x)/Q(x).

 The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can be found by solving P(x) = 0 (or set R(x) = 0 and solve).

 The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ can be found by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Step 4: F**ind the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and calculate the \_\_\_\_\_\_\_\_\_\_\_\_\_ of the holes.

**Step 5:** Locate any \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ asymptotes.

* Let R(x) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to find \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Step 6:** Create a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Find values within each \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Indicating specific \_\_\_\_\_\_\_\_\_\_\_\_\_ and whether the graph is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the x-axis.

**Table Set up for Polynomial and Rational Function:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Intervals (determined by real roots aka \_\_\_\_\_\_\_\_\_\_\_** | #of columns will vary based on the # of Real Roots |  |  |
| **X- value (in each interval)** |  |  |  |
| **Work: Plug in the x-value** |  |  |  |
| **Point on the graph (x,y)** |  |  |  |
| **Location: Above or Below the x-axis** |  |  |  |

**Step 7:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the graph using \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gathered from the previous steps.