**(+) Activity 4.3.6 – Graphing Rational Functions V**

**Section I (+)**

Sketch the graphs of the following functions. For each graph, identify the vertical and horizontal asymptotes, holes, zeros, *x*-intercept(s), *y*-intercept, and domain. If something does not exist, state so.

1. 

V.A.:

H.A.:

Hole:

Zeros:

x-intercept(s):

y-intercept:

Domain:

1. 

V.A.:

H.A.:

Hole:

Zeros:

x-intercept(s):

y-intercept:

Domain:

1. 

V.A.:

H.A.:

Hole:

Zeros:

x-intercept(s):

y-intercept:

Domain:

1. 

V.A.:

H.A.:

Hole:

Zeros:

x-intercept(s):

y-intercept:

Domain:

**Asymptote or Hole?**

To determine whether the graph of a rational function has a vertical asymptote or a hole at a restriction, proceed as follows:

1. Factor the numerator and denominator of the original rational function *f*. Identify any restrictions on *f*.
2. Reduce the rational function to lowest terms, naming the new function *g*. Identify any restrictions on the function *g*.
3. Those restrictions of *f* that remain restrictions of the function *g* will be used to define the vertical asymptotes of the graph of *f*.
4. Those restrictions of *f* that are no longer restrictions of the function *g* will be the x-coordinates of the “holes” of the graph of *f*.
5. To determine the coordinates of the “holes”, substitute each restriction of *f* that is not a restriction of *g* into the function *g* to determine the *y*-value of the hole.
6. Write the equation of a rational function *g*(*x*) who has a zero at 0, vertical asymptotes at

*x* = 2 and *x* = -1, and a horizontal asymptote at *y* = 3.

1. Write the equation of a rational function *f*(*x*) who has zeroes at 3 and -4, a hole at

*x* = -2, a vertical asymptote at *x* = 5, and a horizontal asymptote at *y* = 4.

Name the vertical asymptotes, horizontal asymptotes and holes in the graphs of the following equations. **Do not use a calculator**.

1. V.A. H.A.

Hole

1. V.A.

H.A. Hole

**Section II (+)**

If the numerator's degree is one degree greater than the denominator’s degree, you have a *slant asymptote* of the form . You will need to use long division to find the equation of the slant asymptote.

**Example:** Find the slant asymptote of the rational function .

**Solution***:* Perform long division.

-*x* + 1

*x* – 2 | -*x*2 + 3*x* + 1

-*x*2  + 2*x*

*x* + 1

*x* – 2

3

Ignore the remainder and use only the polynomial part. So, is the slant asymptote (S.A.) as shown above with the dotted line.

Graph the following functions and identify the features listed below.

1. 

V.A.:

S.A.:

Hole:

Zero(s):

x-intercept(s):

y-intercept:

Domain:

1. 

V.A.:

S.A.:

Hole:

Zero(s):

x-intercept(s):

y-intercept:

Domain:

1. 

V.A.:

S.A.:

Hole:

Zero(s):

x-intercept(s):

y-intercept:

Domain: