**Algebra II UNIT 1: Features of Functions**

For this unit you are expected to master the following concepts:

[1.1] know and use the definition of a function; recognize and use function notation;

[1.2] name the domain and range of a function;

[1.3] read and interpret the graph of a function;

[1.4] name and explain increasing and decreasing behaviors of functions;

[1.5] name and explain the intercepts of a function;

[1.6] name and explain the end behaviors of a function;

[1.7] name any extrema (minima or maxima) for a function;

[1.8] given a value for x, find f(x); given a value for f(x), find x.

Here are sample questions for this unit. This is not a full, comprehensive set of problems.

[1] Name the domain and range for f(x), which f(x)

is graphed to the right:

[2] Is f(20) greater than, equal to, or less than f(10)? Explain your response.

[3] Name any minima or maxima for f(x).

[4] Examine the graph of g(x): identify where g(x) is g(x)

increasing and where it is decreasing.

[5] Name the domain and range of g(x).

[6] Name the x- and y-intercepts of g(x).

[7] For g(x), suppose x represents time in minutes

and g(x) represents the temperature of a storage unit.

Name the time that corresponds with a temperature of

0.

[8] Name any minima or maxima for g(x).

[9] Given that h(x) = 2x – 5, find h(-1).

[10] Given that j(x) = $\sqrt{4+3x}$ , find x when j(x) = 1.

Some people learn these skills because they are told to learn them; some people wonder why they have to know them. Go ahead and wonder—but if you want to succeed, figure it out.

**Algebra II Lesson 1.1 Functions and Function Notation**

🡪***What is a function***? A function is a special relationship between input values and related output values. For example, the outdoor temperature in your backyard is a function of time:

Let t = time in hours past midnight, and let f(t) = the temperature in degrees Fahrenheit at t.

When t time = 7 | 8 | 9 | 10 | What makes this a function is that for each time t,

then f(t) temp. = 68 | 72 | 77 | 81 | there is only one temperature f(t).

\*\***Here’s the important point: For f(t) to be a function, then for each t value, there is ONLY ONE f(t) value; for any function where y = f(x), for EACH input x, there is ONLY ONE output y.**

f(t) is a function and its graph shows it is a function: no two points of the graph have the same x value. The graph of f(t) passes the **vertical line test**: wherever you draw a vertical line, the line will intersect f(t) at only one point.

If you wonder what f(t) means, it means “the function of t”: it does not mean multiply f by t. When you read f(x) = x2 – 5x, you should say, “The function of x equals x squared minus five x.”

The relation R that is graphed below f(t) is NOT a function. Notice the graph of R does not pass the vertical line test: if you draw a random vertical line that intersects the graph, the line will touch more than one point.

**SAMPLE QUESTIONS**

**Now it’s your turn: you should see if you can answer these sample questions.**

Determine which of the following relations are functions. In each case, explain your thinking.

[1] [2] (-2, 3), (-2, 2), (-1, 1), (0, 0), (1, 1)



 [3] [4]

**Algebra II Lesson 1.2 Domain and Range of a Function**

The **domain** of a function is the set of all input values (in many cases, the set of all x values) that you can plug into a function, in order to find a function value.

The **range** of a function is the set of all output values (in many cases, the set of all y values) you can get for a function.

You will be asked to name the domain and range for a given function.

EXAMPLE 1.2 A Name the domain and range for f(x) = $\sqrt{x-3}+5$.

*Solution*: To name the domain for f(x), you need to realize that you cannot take the square root of any number below zero. Therefore you need to set the radicand x – 3 > 0 and solve for x: If x – 3 > 0, then x > -3. Your domain is such that x must be -3 or greater. This is your domain. In set notation, we say {x| x > -3}; in interval notation we say [-3, $\infty $). The square bracket tells you -3 is included, while the parenthesis tells you infinity is not included.

The range of f(x) can be identified by realizing that, since the lowest value possible for $\sqrt{x-3}$ is zero, the lowest value for $\sqrt{x-3}+5$ is 5. f(x) can go higher than 5: it just cannot go below 5. Therefore, for the range we say this: y > 5. In set notation, we say {y| y > 5}; in interval notation we say [5, $\infty $).

EXAMPLE 1.2 B Name the domain and range for g(t), g(t)

which is graphed at the right.

*Solution*: If you look closely, the graph goes left and right without end: we can’t graph the entire function; it continues beyond the page. Therefore the domain is ($-\infty ,\infty $), the set of all real numbers.

The graph is limited in how high it goes: the highest g(t) value is 9. Therefore the range is [9, $\infty $), the set of all numbers 9 and above.

**SAMPLE QUESTIONS**

**Try these questions.** For each function, name the domain and range.

[5] y = x2 – 6. [6] [7] f(x) = $\sqrt{2x+1}$



**Algebra II Lesson 1.3 Reading and Interpreting Graphs of Functions**

To the right is the graph of a function that

relates the time of day t to the temperature h(t), in a controlled environment.

Let t represent time in hours, t = 0 represent the time at midnight on March 4, and let h(t) represent the temperature at time t.

You can use the graph to tell you several things:

\*At time t = 0 (midnight, March 4), the temperature h(0) = 56.26o. -10 0 10 20

\*h(4.5) = 47. We say, “h of 4.5 equals 47.” In real English, at 4:30 a.m., the temperature is 47o.

\*If you need to state the temperature at t = 10 (10 hours after midnight), you can estimate this. The x-axis is scaled with five-hour increments, so at t = 10, h(10) appears to be about 60, so at 10:00 a.m., the temperature is about 60o.

\*You can see that the graph shows a minimum temperature of 47o and a maximum temperature of 77o.

\*The function is periodic: it repeatedly goes up and down.

\*If you look at the change in time t from high point to the next high point, you will see that $∆t$—the change in t—is 24 hours. We can use this change to say that every 24 hours, the temperature returns to what it was in this controlled environment. 🡪This means that when t = 24, the temperature will be 56.26o, the same as at t = 0.

**SAMPLE QUESTIONS**

Use the graph of y = g(x)at the right to answer the following questions.

[8] Find g(-1). [9] Find g(5).

[10] Find x when g(x) = 3.

[11] Find the change in y (called $∆y,$ “delta y”) from x = 0 to x = 2.

[12] Is g(-10) greater than, equal to, or less than g(-5)? Explain your thinking.

**Algebra II Lesson 1.4 Increasing and Decreasing Behavior of a Function**

Look at the graph of the function f(x) to the right. Assume that the domain of f(x) is $(-\infty ,\infty )$, the set of all real numbers. Also assume that all trends for f(x) are shown: f(x) continues to climb as x becomes more negative beyond -5, and f(x) continues to fall as x becomes more positive beyond 5.

Read the graph as a book from left to right; in fact, imagine you start at the left and ride the graph as though it is a roller coaster. The roller coaster **decreases** from the far left until x = -4. Then the roller coaster **increases** from x = - 4 until x = -1. The roller coaster decreases again until x = 0; then the roller coaster increases from x = 0 to x = 2. Finally, the roller coaster decreases from x = 2 onward, as x approaches infinity.

These **intervals of increase and decrease** are important in understanding a function. Here, f(x) increases in the intervals $(-4, -1)$ and (0, 2); the function decreases in the intervals $(-\infty ,-4)$, (-1, 0) and $(2,\infty )$.

**You should notice that you are to name the intervals on the *x-axis* where the function increases and decreases.**

Graph the function g(x) = -|x + 1| and look at the intervals of increase and decrease.

When x = -3 -2 -1 0 1 2

then y = -2 -1 0 -1 -2 -3

The more of the function that you graph, the more you will see that g(x) increases in the interval $(-\infty ,-1)$, where $-\infty $ < x < -1 . g(x) decreases in the interval $(-1,\infty )$, where

-1 < x < $\infty $.

**SAMPLE QUESTIONS**

[13] Identify intervals of increase and decrease for y = x2 – 4.



[14] Identify intervals of increase and decrease for h(x), which is graphed at the right.

**Algebra II Lesson 1.5 Intercepts of Functions**

Intercepts of functions are significant in many real-life situations. For example, look at the function a(t) = -90,000 + 600t. This function represents the balance in Saria’s account with Deutche Bank. Saria took out a loan to start her own bistro. She owes the bank $90,000 and has agreed to pay the bank $600 a month. For this function, t = time in months after she borrows the money and a(t) = the balance of her account (the amount she owes).



The **y-intercept** (0, -90,000) represents where Saria’s loan starts, at -$90,000. The **x-intercept** (150, 0) represents where her loan ends: she will have paid off the entire loan in 150 months.

**Notice that the x-intercept is where y = 0 and the**

**y-intercept is where x = 0. You should know to**

**substitute 0 for x to find the y-intercept and vice**

**versa.**

Here is another example: let h(t) = -16t2 + 80t. Here the function represents the height of a toy rocket that is launched from the ground with a starting blast of 80 feet per second into the air; while the blast sends the rocket up, gravity pulls the rocket down at an acceleration of 16 feet per second squared. t = time in seconds and h(t) = height in feet.

The t-intercepts of this function show you when the rocket starts rising and stops falling. The rocket begins at t = 0; the rocket falls back to the ground at t = 5 seconds.

🡪Notice the difference between the abstract function

y = -16x2 + 80x and the actual function h(t) = -16t2 + 80t that fits the real-life rocket. The abstract function for y has the domain of all real numbers, while the real-life function for the rocket has the domain [0, 5], because the rocket starts rising at t = 0 and stops at t = 5.

**SAMPLE QUESTION**

 [15] Find the x-intercept and the y-intercept for the function 20x + 10y = 60, in which x represents the number of adults who attend a concert and y represents the number of children under 12 who attend the concert. Explain what each intercept represents; also explain your reasoning.

**Algebra II Lesson 1.6 End Behavior of a Function**

To determine the **end behavior** of a function, you need to notice overall trends—you need to note what y does as x approaches specific values. While every function has its own end behaviors, certain types of functions have behaviors in common.

EXAMPLE 1.6 A

To the right is the graph of y = $\sqrt{9x}$ – 3. You can see one endpoint of the function: (0, -3). However, there is no other endpoint: y continues to increase as x increases. The higher the x value that you plug in, the higher the y value you get out. For this reason, we say that as x🡪$\infty $, y🡪$\infty $. Eventually you will be expected to use a limit to express this end behavior:

The limit, as x approaches infinity, is that y approaches infinity.

$\lim\_{x\to \infty }\sqrt{9x}-3$ = $\infty $.

EXAMPLE 1.6 B

To the right is the graph of the function f(x) = $\frac{1}{x}$.

Here f(x) is a rational function, a fractional one. **IT IS VERY IMPORTANT THAT YOU GET THIS BASIC CONCEPT: DIVIDING BY ZERO IS MEANINGLESS GOBBLEDYGOOK.** Because you cannot divide by zero, x cannot equal zero.



At the right is the graph of f(x). There are four end behaviors we need to name.

[a] As x 🡪 $-\infty $, y 🡪$0$: this means that as x approaches $-\infty $, y approaches $0$. Notice that as x goes farther left, y gets closer to zero high.

[b] As x 🡪 $0^{-}$, y 🡪$-\infty $: this means that as x approaches $0$ from the left, y approaches $-\infty $. Notice that as x goes from $-\infty $ to 0, y goes farther DOWN without bound.

[c] As x 🡪 $0^{+}$, y 🡪$\infty $: this means that as x approaches $0$ from the right, y approaches $\infty $. Notice that as x goes from $\infty $ to 0, y goes farther UP without bound.

[d] As x 🡪 $\infty $, y 🡪$0$: this means that as x approaches $\infty $, y approaches $0$.

**SAMPLE QUESTION**

[16] Name the end behavior of the function graphed at the right.



**Algebra II Lesson 1.7 Extrema (Minima and Maxima) of a Function**

A **minimum** is the lowest y value for a function on a given interval for x. A **relative minimum** (the same as a local minimum) is the lowest y value for a specific section of a function’s graph—as long as it is not an endpoint. An **absolute minimum** (the same as a global minimum) is the lowest value of all for a function. Minimum is singular (for one); minima is plural (for more than one).

A **maximum** is the highest value for a function, for a particular section of the graph or the entire graph. A maximum may be relative or absolute. Maximum is singular, while maxima is plural.

High and low function values together are known as **extrema**. Extremum is singular; extrema is plural.



To the right is the graph of f(x). Note: the domain of f(x) is [-5, 4].

f(x) has a lowest point of (0, -2); therefore f(x) has an absolute minimum of -2 (at x = 0).

f(x) has an endpoint at (-5, -1). This is not a relative minimum because it is not the lowest point for a section of the graph beyond itself to the left and right.

f(x) has an absolute maximum of 2 (where x = 4). While (4, 2) is an endpoint, it is also the highest point of all on f(x), so it contains the global maximum of 2.

f(x) has a local maximum of 1 (where x = -3). 1 is the highest y value on the interval (-5, 0) for x.

**SAMPLE QUESTIONS**

Use the graph of g(x) at the right to answer the following questions.

[17] Name the absolute maximum of g(x).

[18] If there are any local maxima of g(x), name them.

[19] Name the absolute minimum of g(x).

[20] If there are any local minima of g(x), name them.

[21] Which points are endpoints and not extrema? Explain your response.

**Algebra II Lesson 1.8 Finding Function Values—PLUS Putting it All Together**

Finding a value for f(x) means plugging a value for x into the function and evaluating the expression. Finding an x value for a given function value means plugging a value in for y and solving for x.

EXAMPLE 1.8 A Find f(-8) for f(x) = -x2 – 2.

*Solution*: Plug -8 for x into the formula: f(-8) = -(-8)2 – 2 = -(64) – 2 = -66.

EXAMPLE 1.8 B Given g(x) = $\sqrt{25-x^{2}}$ Find x when g(x) = 3.

*Solution*: Plug 3 in for g(x): 3 = $\sqrt{25-x^{2}}$ . Then solve: Square both sides: 9 = 25 – x2

 Subtract 25: -25 -25

 -16 = -x2

 Multiply by -1: 16 = x2

 Take the square root: 4 or -4 = x.

 \*Check both solutions to see they both work.

**SAMPLE QUESTIONS**

[22] Given h(t) = 2t3 - $\sqrt{3t^{2}-7}$, find h(-2).

[23] Given f(x) = $\sqrt{2x^{2}-2}$, find x when f(x) = 4.

Use the graph of g(x) = -x2 + 4x to answer questions 24-30.

[24] Name the x- and y-intercepts of g(x).

[25] Name any extrema of g(x).

[26] Name the end behavior of g(x).

[27] Name g(-1).

[28] Find x when g(x) = 3.

[29] Name the domain and range of g(x).

[30] Name intervals where g(x) is increasing and where g(x) is decreasing.

[31] Which of the following are functions? [a] x2 – y = 1 [b] x2 – y2 = 1 [c] x – y2 = 1

**SAMPLE QUESTION ANSWERS**

Lesson 1.1

[1] The circle is not a function: it does not pass the vertical line test. Also, when x = 0, y has more than one value, and this disqualifies the graph as a function.

[2] This is not a function: when x = -2, y has more than one value.

[3] This is a function: for each x, y has only one value. (It is okay that y is 2 for each x.)

[4] This is not a function: the graph does not pass the vertical line test.

Lesson 1.2

[5] If you graph the function, you will see that x can go as negative or a positive as you allow, so the domain is this: ($-\infty ,\infty $), the set of all real numbers. The lowest point is (0, -6), so the range is this: ($-6,\infty $).

[6] The graph continues indefinitely left and right, so the domain is ($-\infty ,\infty $). y has only one value, -1, so (-1) is the range.

[7] The radicand 2x + 1 must be zero or greater; if you solve 2x + 1 > 0, x > -0.5; therefore, the domain is ($-0.5,\infty $). The range is ($0,\infty $).

Lesson 1.3

[8] g(-1) = 4. y is 4 when x = -1. [9] g(5) = 4. [10] x = 4 and 0 when g(x) = 3.

[11] y goes down 2 as x goes from 0 to 2: $∆y$ = -2 over this interval.

[12] If you follow the graph going left, you can see it rises as x becomes more negative. Therefore g(-10) > g(-5).

Lesson 1.4

[13] Once you graph the function, you should see it decreases in the interval $(-\infty , 0)$ and increases in the interval $(0, \infty )$.

[14] g(x) increases in the intervals $(-\infty , -3)$ and $(-1, \infty )$. g(x) decreases in the interval (-3, -1).

 Notice you do not need to identify y values: you name values on the x-axis.

Lesson 1.5

[15] If you substitute 0 for x, then y = 6: the y-intercept is (0, 6) and this represents how many children can attend the concert if no adults attend. If you substitute 0 for y, then x = 3: the x-intercept is (3, 0), and this represents how many adults can attend the concert if no children attend.

Lesson 1.6

[16] As x approaches $-\infty $, y approaches $-\infty $; as x approaches $\infty $, y approaches $\infty $.

Lesson 1.7

[17] The absolute maximum is 1 (where x = 0).

[18] There are no relative maxima.

[19] The global minimum is -3 (where x = -4).

[20] There is a local minimum of -1, on the interval 0 < x < 3.

[21] (-6, -1) and (3, 0) are endpoints. Neither contains an absolute maximum or minimum; g(x) does not continue left beyond (-6, -1) or right beyond (3, 0).

Lesson 1.8

[22] h(-2) = 2(-2)3 - $\sqrt{3(-2)^{2}-7}$ = 2(-8) - $\sqrt{12-7}$ = -16 – $\sqrt{5}$. \*This is about -18.24, but the exact value is -16 – $\sqrt{5}$. If you want to look at something pretty, search the internet.

[23] $\sqrt{2x^{2}-2}$ = 4 ; (STEP 1: Square both sides.) 2x2 – 2 = 16; (STEP 2: Add 2.) 2x2 = 18;

(STEP 3: Divide by 2.) x2 = 9; (STEP 4: Take square root.) x = + 3. (STEP 5: Check solutions.)

[24] The x-intercepts are 0 and 4; the y-intercept is 0.

[25] g(x) has a maximum of 4. [The high point is (2, 4).]

[26] Here is the end behavior for g(x): $\lim\_{x\to -\infty }-x^{2}+4x$ = $-\infty $ and $\lim\_{x\to \infty }-x^{2}+4x$ = $-\infty $.

In other words, as x approaches $-\infty $, g(x) approaches $-\infty $, and as x approaches $\infty $, g(x) approaches $-\infty $. As x goes more negative, or more positive, y continues to go farther down.

[27] g(-1) = 3.

[28] When g(x) = 3, x = -1 or 3. The graph passes through (-1, 3) and (3, 3).

[29] The function goes left and right forever, so the domain is $(-\infty ,\infty )$. The graph has a maximum of 4 high, so the range is $(-\infty , 4]$.

[30] g(x) increases in the interval $(-\infty ,2)$; g(x) decreases in the interval $(2,\infty )$. Notice that as a roller coaster, the graph rises until you reach x = 2.

[31] Choice A is a function, because for each x, y can only be one value. Because y is squared in choices B and C, when x is, say, 3, y can either be positive or negative: y can be more than one value. B and C are not functions.

**Algebra II U 1-0 Function Match (Before Lesson 1-1) Put all responses on this paper.**

UNIT 1, DAY 1

**For each description, name the equations of the correct graphs that match. More than one item can match each graph, and more than one graph can match each item.**

**For EACH MATCH, SHOW or EXPLAIN your thinking.**

****ASSUME that EVERY graph continues beyond what is shown.

[1] While Sacramento experienced an outbreak of the Zombie ***y = 2x***

 virus in the recent past, the National Guard and the CDC have

 reduced the number of infections by 50% each day. (The y-axis

 measures the infected in thousands.)

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[2] In fleeing people with the Zombie virus, Santa Rosans

 clogged all roads out of the city: they could only escape ***y = (*** $\frac{1}{2}$ ***)x***

 at a steady rate of $\frac{∆y}{∆x}$ , where $∆$y = 2 (in thousands of people)

 and $∆$x = 1 (in days).

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[3] This function has a y-intercept of a thousand. ***y = x2+ 6x***

 (The y-axis measures infections in thousands.)

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[4] The number of infections for the Zombie virus is always increasing.

 (The y-axis measures infections in thousands.)

 ***y = 2x***

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Continue on the back.

[5] This function shows a maximum of 9 thousand infections. (The y-axis measures infections in thousands.

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[6] This function has no x-intercepts.

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[7] This function has two x-intercepts.

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[8] For this function, as x number of days increases beyond measure, the y number of infections approaches zero.

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**Algebra II UNIT 1, DAY 2 NOTES 1.1, 1.2, 1.3**

**[1.1] Know and use the definition of a function; recognize and use function notation.**

**[1st] A function is**

**[2nd] Which of the following are functions?**

****

**[a] [b]**

**[c] y = x2 [d] x = y2**

 **When x = -2 | -1 | 0 | 1 | 2 When x = 4 | 1 | 0 | 1 | 4**

 **then y = 4 | 1 | 0 | 1 | 4 then y = -2 | -1 | 0 | 1 | 2**

**[3rd] What is the vertical line test?**

**[4th] Suppose you are told f(t) = -16t2 + 64t.**

**[a] What does f(t) represent?**

**[b] Find f(2). [c] Find x for f(x) = 0.**

**Algebra II UNIT 1, DAY 2 (Continued) NOTES 1.2-1.3**

**[1.2] Name the domain and range of a function;**

**[1.3] read and interpret the graph of a function.**

**[1st] The domain of a function is**

**[2nd] The range of a function is**

 **f(x)**

****

**[3rd] For the function f(x) that is graphed, name**

**[a] the domain,**

**[b] the range.**

**[4th] Show and say how to graph**

 **a(x) =** $-\frac{7}{3}$ **x + 5.**

**[5th] [a] Name the domain and range g(x)**

**of g(x).**

****

**[b] Approximate f(1).**

**[c] Approximate the x value**

**when f(x) = -5.**

**[d] As x approaches 0 from the left, what does y do?**

**[e] As x approaches 0 from the right, what does y do?**

**Algebra II UNIT 1, DAY 3 Key Features of Functions**

 **Page 1**

**For y = -** $\frac{1}{2}$ **x + 5, name the following features:**

**[a] the domain,**

**[b] the range,**

**[c] the intercepts (x and y),**

**[d] intervals of increasing/decreasing behavior,**

**[e] extrema (minima or maxima, if there are any),**

**[f] end behavior.**

**USE the examples to help you.**

**Algebra II Key Features page 2**

**For the function that is graphed, name the following features:**

**[a] the domain,**

**[b] the range,**

**[c] the intercepts (x and y),**

**[d] intervals of increasing/decreasing behavior,**

**[e] extrema (minima or maxima, if there are any).**

**Use the examples to help you.**

**Algebra II Key Features p.3**

 **y = 2x + 1 has the following**

**features:**

**\*The domain is the set of all**

**real numbers, (**$-\infty ,\infty $ **) because**

**any real can be multiplied by 2**

**and then added to 1, to get a real y.**

**\*The range is the set of all real numbers, (**$-\infty ,\infty $ **): y can be negative, 0 or positive.**

**\*The x-intercept (where y = 0) is (**$\frac{-1}{2}$ **, 0); the y-intercept is**

**(0, 2).**

**\*y always increases as you read the graph from left to right, so the function is increasing everywhere along the domain (**$-\infty ,\infty $ **).**

**\*There is no lowest or highest point, so there are no extrema.**

**\*The end behavior is this: As x decreases, y decreases;**

**as x increases, y increases.**

**\*This function has a steady rate of change:** $\frac{∆y}{∆x}=\frac{change in y}{change in x}=\frac{2}{1}$

**= 2.**

**For the function in the graph, here are key features: p.4**

****

**\*The domain is [-8, 0], because x goes as low as -8 and as high as 0.**

**\*The range is [-1, 3]: y goes from -1 to 3.**

**\*The x-intercept is (-6, 0); the y-intercept is (0, 3).**

**\*The function is bounded above because it only goes up to y = 3; the function is bounded below because it only goes down to y = -1.**

**\*y always increases as you read the graph from left to right, so the function is increasing everywhere along the domain**

**[**$-8,0$ **].**

**\*The minimum is -1 (lowest y); the maximum is 3 (highest y).**

**\*This function has a steady rate of change:** $\frac{∆y}{∆x}=\frac{change in y}{change in x}=\frac{1}{2}$

**Algebra II U 1-3 Get in Line Put all responses on this paper.**

1] [a] Graph f(x) = $\frac{-2}{ 3}$ x – 4.

[b] Explain what happens to f(x) as x

becomes more negative:

As x 🡪 - $\infty $, f(x) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[c] Explain what happens to f(x) as x

becomes more positive:

As x 🡪 $\infty $, f(x) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[d] Name the x-intercept for f(x). Explain your method.

The x-intercept is \_\_\_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[e] Name the domain and range for f(x):

The domain is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The range is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

2] [a] What type of function is g(x)? JUSTIFY your response. x | - 8 | -4 | 4 | 8 |

 y | -5 | -2 | 4 | 7 |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[b] Graph g(x). 🡪

[c] As x 🡪 $\infty $, y 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

[d] Does g(x) have a steady rate of change, $\frac{Δy}{Δx}$ ? If so,

name that rate.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[e] Write the equation for g(x) in terms of x.

[f] Is (12, 10) a point on the graph of g(x)? WHY or WHY NOT?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[3] Examine the function h(x) that is graphed. 🡪

[a] What type of function is h(x)? Defend your reasoning.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[b] Name the domain of the function: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[c] Name the range of the function: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[d] Name the x-intercept: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[e] Name the y-intercept: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[4] Yesterday Jasmine went jogging. She started 1.3 kilometers from home at time t = 0. At t = 10 minutes, she was 1.5 km from home; at t = 15 minutes, she was 1.6 km from home; and at t = 25 minutes, she was 1.8 km from home.

[a] At what rate did Jasmine jog, in kilometers per hour?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[b] Write an equation that models Jasmine’s distance from home as a function of time.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[c] Suppose Jasmine stopped jogging after 45 minutes, which means your equation only fits her distance from home up to that time. Find the range of the function of your equation.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

[5] [a] Remember triangle congruence from Geometry? Given $∆$PDQ so that DQ = 20 cm, m/ D = 90o,

PQ = 25 cm, and given $∆$RAF so that AF = 20 cm, RF = 25 cm, m/ A = 90o, is it true that $∆$PDQ $\tilde{=}$ $∆$RAF? Explain your thinking. [b] Find RA.

**Algebra II UNIT 1, DAY 4 NOTES 1.4, 1.5**

**[1.4] Name and explain increasing and decreasing behaviors of functions;**

**[1.5] name and explain the intercepts of a function.**

**Suppose you are riding the following function from left to right.**

****

* **What is the domain of the function?**
* **On what sections of the domain are you increasing?**
* **On what sections of the domain are you decreasing?**

**NOW suppose you are riding a different function from left to right.**

* **What is the domain of the function?**
* **On what sections of the domain are you increasing?**
* **On what sections of the domain are you decreasing?**

****

**🡪What are the intercepts of this function?**

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Jamil inherited $12,000 from his grandmother: he put the money into a bank account that he will use to pay his bills. On average, his bills are about $1,500 per month.**

**The function a(t) = $12,000 – $1,500t tracks the amount of money in his account over time. t = the number of months after today and a(t) = the amount of money in the account at time t.**

**\*Find the intercepts of this function.**

**\*Say what each intercept represents.**

**Algebra II UNIT 1, DAY 5 NOTES 1.6, 1.7, 1.8**

**[1.6] name and explain the end behaviors of a function;**

**[1.7] name any extrema (minima or maxima) for a function;**

**[1.8] given a value for x, find f(x); given a value for f(x), find x.**

****

**Examine the function**

**y =** $\frac{1}{x-3}$ **.**

**[1st] What x values does the graph appear to avoid?**

**Why?**

**[2] What y values does the graph appear to avoid?**

**Why?**

**[3] Name the domain and range.**

**[4] As x approaches** $-\infty $**, what does y do?**

**[5] As x approaches** $\infty $**, what does y do?**

**[6] As x approaches 3, what does y do?**

**[7] Write the set of end behaviors in the form of limits.**

**Examine the function**

**f(x) =** $\sqrt{5-x}$ **+ 2.**

**[8] What x values does the graph appear to avoid?**

**Why?**

**[9] What y values does the graph appear to avoid?**

**Why?**

**[10] Name the domain and range.**

**[11] As x approaches** $-\infty $**, what does y do?**

**[12] Write the set of end behaviors in the form of limits.**

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**[13] An extremum is**

**[14] How is an absolute minimum different from a local minimum?**

**Use the graph of g(x) at the right to answer the following questions.**

**[15] Name the absolute maximum of g(x).**

**[16] If there are any local maxima of g(x), name them.**

**[17] Name the absolute minimum of g(x), if it exists.**



**[18] If there are any local minima of g(x), name them.**

**[19] Which points are endpoints and not extrema? Explain your response.**

 **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**[20] Given h(x) =** $\sqrt{2x+3}$ **– 1, find h(-1).**

**[21] Given h(x) =** $\sqrt{2x+3}$ **– 1, find a when h(a) = 4.**

**Algebra II U 1-8 Tell Me All About It Put all responses on ANOTHER PAPER.**

[1] Given f(x) = 9x2 – 2, find the following: [a] find f(-2); [b] find b if f(b) = 14.

[2]\* Remember triangle congruence from Geometry? Thought so. Given $∆$ABC so that AB = 4 inches, BC = 3.5 inches, m/ A = 40o, and given $∆$DEF so that DE = 4 inches, EF = 3.5 inches, m/ D = 40o, is it true that $∆$ABC $\tilde{=}$ $∆$DEF? Explain your thinking. \*\*KNOW YOUR CONGRUENCE theorems and postulates.

[3] Given g(x), which is graphed at the right, state the following:

[a] the reason g(x) is said to be a function;

[b] the domain; [c] the range;

[d] the end behavior; [e] x-intercepts;

[f] intervals of increasing behavior;

[g] y-intercepts;

[h] intervals of decreasing behavior;

[i] any extrema.

[4] [a] Name the domain and range for f(x), which f(x)

is graphed to the right:

[b] Is f(20) greater than, equal to, or less than f(10)? Explain your response.

[c] Name any minima or maxima for f(x).

[d] If f(a) > f(b), compare a and b: which is greater?

[5] Given f(x) = $\sqrt{3x-12}$ , state the following:

[a] the domain; [b] the range; [c] any extrema; [d] any x-intercepts;

[e] any y-intercepts; [f] intervals of increasing behavior; [g] intervals of decreasing

 behavior.

[h] f(12) in simplest radical form; [i] c when f(c) = 6.