Math Assignment 3

aturcotte2

October 2020

1

Page 166 Question 1

Find the long run behavior for the function as X approaches infinity and negative infinity.

$$F(X) = X^4$$

As X approaches infinity, Y approaches infinity.
As X Approaches negative infinity, Y approaches infinity.

Summary: This problem was not too difficult, I looked up what long run behavior was and did not have any trouble past that.

Page 166 question 16

Find the degree and leading coefficient of the polynomial

$$-2X^3 + X^2 - X + 3$$

Degree=5
Leading coefficient=-2

Summary: This problem was not too difficult, it was just a matter of learning the vocab. I learned that the degree of a polynomial is just the largest exponent. The leading coefficient is the coefficient on the first term once you put it into standard form.

Page 166 question 19

find each long run behavior as x approaches infinity and x approaches negative infinity.

$$3x^2 + X - 2$$

As X approaches infinity, y approaches infinity. AS X approaches negative infinity, Y approaches infinity.

Summary: This problem was not too hard, I remembered how to graph polynomials so I had a good idea of what the graph would like so I knew its long run behavior.

Page 166 Question 21 What is the maximum number of intercepts for a polynomial with a degree of 5?

The maximum number of x intercepts a polynomial can have is the same as its degree, this means that a polynomial to the fifth power will have a maximum of 5 intercepts.

Summary: This problem was not too difficult because I knew from my physics class that the maximum number of x intercepts is the same as the degree of the polynomial.

Page 166 Question 31 Find the horizontal intercepts for each function.

$$F(T) = 2(T-1)(T+2)(T-3)$$

$$F(0) = 2(0-1)(0+2)(0-3)$$
$$F(0) = 2(-1)(2)(-3)$$
$$F(0) = 12$$

12 is the vertical intercept

$$0 = T - 1$$
$$T = 1$$
$$0 = T + 2$$
$$T = -2$$
$$0 = T - 3$$
$$T = 3$$

The horizontal intercepts are 1,-2, and 3.

Summary: this problem was not too difficult but had a lot of step. To find the vertical intercept, I set T as zero and solved. I ended up with 12 and I knew that there was only one vertical intercept. To get the horizontal intercepts, I set every term to zero and solved each one individually.

Page 177 Question 7 find the vertex horizontal and vertical intercepts for the following Function.

$$Y(X) = 2X^2 + 10X + 12$$
$$Xv = -B/2A$$
$$Xv = -10/4$$
$$Xv = -5/2$$

The x value is -2.5

$$Y(-2.5) = 2(-2.5^2) + 10(-2.5) + 12$$
$$Y(-2.5) = -0.5$$

The y value is -0.5
The vertex is (-2.5,-0.5)

The Y intercept is 12, it tells us that in the problem with the +12 at the end.

$$X = -B + or - SQRT(B^2 - 4AC)/2A$$
$$X = -10 + or - SQRT(100 - 96)/4$$
$$X = -10 + or - 2/4$$
$$X = -12/4$$
$$X = -8/12$$
$$X = -3 and - 2$$

the X intercepts are -2 and -3

Summary: this problem was not very hard just long. To find the vertex I first found the axis of symmetry and got the x value of -2.5. After I plugged in

that value and got out the Y value of -0.5. To find the Y intercept I saw in the equation that it was 12 and to find the X i used the quadratic formula and just solved through that to get the two x intercepts.

Page 177 question 13
rewrite the following function into vertex form

$$F(X) = X^2 - 12X + 32$$

$$F(X) = A(X - H)^2 + K$$

$$H = -B/2A$$

$$K = F(H)$$

$$H = 12/2$$

$$H = 6$$

$$F(6) = K$$

$$F(6) = (6)^2 - 12(6) + 32$$

$$F(6) = 36 - 72 + 32$$

$$F(6) = -4$$

$$K = -4$$

$$F(X) = (X - 6) - 4$$

Summary: For this problem I found a helpful video that said that to get to vertex form you need to find the axis of symmetry and once you find that, plug it in and get the Y value. Once you have your vertex, it is easy to put it into vertex form.

Page 178 Question 19 Write an equation for a quadratic with the given features: Vertex at (4,0), and y intercept (0,-4)

$$Y = -0.25(X - 4)^2 - 20$$

Summary: to do this problem I just wrote it in vertex form and just substituted to Y value to get the slope.

Page 178 Question 27 A rocket is launched in the air. Its height, in meters above sea level, as a function of time, in seconds, is given by $H(T) = -4.9T^2 + 229T + 234$
a. From what height was the rocket launched?
b. How high above sea level does the rocket reach its peak?
c. Assuming the rocket will splash down in the ocean, at what time does splash-down occur?

(A)

$$H(T) = -4.9T^2 + 229T + 234$$
$$H(0) = -4.9(0)^2 + 229(0) + 234$$
$$H(0) = 234$$

The rocket was at 234 meters.

(B)

$$H(T) = -4.9T^{@} + 229T + 234$$
$$H(T) = -4.9(T^2 - 46.735T - 47.755)$$
$$H(T) = -4.9(T^2 - 46.735T + (-23.367)^2 - (-23.367)^2 - 47.755$$
$$H(T) = -4.9((T - 23.367)^2 - 23.367^2 - 47.755)$$
$$H(T) = -4.9((T - 23.367)^2 - 593.788)$$
$$H(T) = -4.9 * (T - 23.367)^2 + 2909.561$$

The maximum height is at 2909.561 meters above sea level

(C)

$$-4.9T^2 + 229T + 234$$
$$X = -B + or - SQRT(B^2 - 4AC)/2A$$
$$X = -229 + or - SQRT(229^2 - 4(-4.9)(234))/2(-4.9)$$
$$X = -229 + or - SQRT(52441 - (-4586.4))/ - 9.8$$
$$X = -229 + or - 238/ - 9.8$$
$$X = 1$$
$$X = 47.7$$

It took 47.7 seconds to splashdown.

Summary: this problem was not too difficult it was just a matter of figuring out how to solve each step but once i figured out how to start it was simple.

Page 179 question 31 A box with a square base and no top is to be made from a square piece of cardboard by cutting 6 in. squares out of each corner and folding up the sides. The box needs to hold 1000 in3. How big a piece of cardboard is needed?

$$6X^2 - 1000 = 0$$

$$V = 6X^2$$

$$6X^2 = 1000$$

$$X^2 = 166.667$$

$$X = 12.91$$

the cardboard is 620 inches

Summary:the only difficult part of this problem was getting the original equation but once I got that it was simple solving and I knew there could only be one answer because you cannot have negative length.

Page 191 Question 19 Solve the inequality

$$(X-3)(X-2)^2 > 0$$

$$X = 3$$

$$X = 2$$

$$(X-3)(X-2)^2 > 0 if X > 3$$

Summary: this problem was easy. I found what X equaled at zero and plugged in values and if it was negative I knew it could not be a solution and they were only positive for numbers larger than 3.

Page 191 question 21 Solve the inequality

$$(X-1)(X+2)(X-3) < 0$$

$$X = 1X = -2X = 3$$
$$(1-1)(1+2)(1-3) < 0$$
$$0 < 0$$

$$(-2-1)(-2-2)(-2-3) < 0$$
$$-60 < 0$$

$$(3-1)(3-2)(3-3) < 0$$
$$0 < 0$$

$$-2 < X < 1 and X > 3$$

Summary:For this inequality i solved for every term and solved to see if they would satisfy the inequality and found the solutions. I did not have too much trouble with this.

Page 192 Question 31 Write an equation for the polynomial with the given features Degree: 3 Zeros at -2, 1, 3 and vertical intercept at (0,-4)

$$F(X) = A(X+2)(X-1)(X-3)$$
$$-4 = A(0+2)(0-1)(0-3)$$
$$-4 = A(2)(-1)(-3)$$
$$-4 = A(-6)$$
$$-2/3 = A$$
$$F(X) = -2/3(X+2)(X-1)(X-3)$$

Summery:To start this problem I used the three zeros as points and put that in to get the slope I plugged in (0,-4) for the vertical intercept. The only trouble I had came in the beginning when I was trying to get started but once I figured it out it was easy.

Page 192 Question 32 write an equation for the function with the given features Degree: 3 zeros at -5 -2 1 and a vertical intercept at (0,6)

$$F(X) = A(X+5)(X+2)(X-1)$$

$$6 = A(X+5)(X+2)(X-1)$$

$$6 = A(0+5)(0+2)(0-1)$$

$$6 = A(5)(2)(-1)$$

$$6 = A(-10)$$

$$-3/5 = A$$

$$F(X) = -3/5(X+5)(X+2)(X-1)$$

Summary: This problem I did not have too much trouble with. I knew how to start using the same method from the last problem. I made the zeros points and plugged in the Y intercept to find the slope.

Page 193 question 51 A rectangle is inscribed with its base on the x axis and its upper corners on the parabola Y=5-X squared. What are the dimensions of such a rectangle that has the greatest possible area?

$$A = 2XY$$

$$Y = 5 - X^2$$

$$A = 2X(5 - X^2)$$

$$A = 10X - 2X^3$$

$$Y = 8.61$$

$$X = 1.29$$

$$Base = 2.58$$

$$Height = 8.61$$

$$A = 22.2138$$

Summary: For this problem the first thing I did was graph the parabola. Then I Found the vertex and found the height and and the X and just plugged them into the Area formula.

Page 202 question 25 Find the rest of the real zeros and factor the polynomial.

$$X^3 + 2X^2 - 3X - 6, C = -2$$

$$(X^3 + 2X^2)(-3X - 6)$$

$$X^2(X + 2) - 3(X + 2)$$

$$(X^2 - 3)(X + 2)$$

$$X = -2, -SQRT3, SQRT3$$

Summary: for this problem I solved by grouping so I made my 2 groups and found the GCF to pull out and they were the same so I knew it would work. They gave us -2 so i just had to solve for X squared -3 and got positive and negative square roots of three. Overall I had some trouble figuring out which method to factor with.

Page 202 Question 26 Solve for the true zeros and factor

$$2X^3 - X^2 - 10X + 5, c = 1/2$$

$$(2X^3 - 10X)(-X^2 + 5)$$

$$2X(X^2 - 5) - (X^2 - 5)$$

$$(2X - 1)(X^2 - 5)$$

$$X = 1/2, -SQRT5, SQRT5$$

Summary: this problem I did the same thing as last time. I made my two groups pulled out my GCF and then solved for my zeros.

Page 209 Question 1 For each of the following polynomials, use Cauchy's Bound to find an interval containing all the real zeros, then use Rational Roots Theorem to make a list of possible rational zeros

$$F(X) = X^3 - 2X^2 - 5X^+6$$

$$2, 5, 6$$

$$6 + 1 + 7$$

$$2 + 5 + 6 = 13$$

The zeroes are between 7 and -7

$$X^3 - 2X^2 - 5X + 6/x - 1$$
$$X^2 - x - 6$$
$$(X - 1)(X + 2)(X - 3)$$

roots are 1, -2, 3

Summary:This problem was difficult because it was 2 new methods I have never done before so I had to learn how to do them.

Page 209 Question 4 For each of the following polynomials, use Cauchy's Bound to find an interval containing all the real zeros, then use Rational Roots Theorem to make a list of possible rational zeros.

$$F(X) = X^3 + 4X^2 - 11X + 6$$

$$4, 11, 6,$$
$$11 + 1 = 12$$
$$4 + 11 + 6 = 21$$

the boundary is 12 and -12

$$X^3 + 4X^2 - 11X + 6/x - 1$$

$$X^2 + 5X - 6$$
$$(X - 1)(X + 6)$$

The roots are 1, 1, -6

Summary:This problem was easier than the last one because now I am more familiar with the technique to solve these problems.

Page 209 Question 11 Find the real zeros

$$F(X) = X^3 - 2X^2 - 5X + 6$$

$$F(X) = X^3 - 2X^2 - 5X + 6/X - 1$$
$$X^2 - x - 6$$
$$(X - 3)(X + 2)$$

roots are -2,1,3

Summary: This problem was not too bad, just getting used to this type of problem.

Page 209 Question 14 Find the real zeros

$$F(X) = X^3 + 4X^2 - 11X + 6$$

$$X^3 + 4X^2 - 11X + 6/X - 1$$

$$X^2 + 5X - 6$$

$$(X + 6)(X - 1)$$

roots are -6,1,1

Page 209 Question 16 find all real zeros

$$F(X) = -2X^3 + 19X^2 - 49X + 20$$

$$-2X^3 + 19X^2 - 49X + 20/2X - 1$$

$$-X^2 + 9X - 20$$

$$(X - 4)(X - 5)$$

zeros are 0.5, 4, 5

Summary: I did not have too much problems but the coefficient messed me up a bit but I figured it out eventually.

Page 217 Question 6 Simplify each expression to a single complex number

$$4 + SQRT - 20/2$$

$$4 + 2ISQRT5/2$$

$$2 + ISQRT5$$

Summary: I had to watch a video as a refresher on this topic because I have not done it for a while but I got the hang of it pretty quickly.

Page 217 Question 20 Simplify each expression to a single complex number

$$6 - 2I/3$$

$$2 - 2I/3$$

Summary: I did not have any trouble with, I remembered how to do it from high school.

Page 217 Question 25 Find all of the zeros of the polynomial then completely factor it over the real numbers and completely factor it over the complex numbers

$$F(X)X^2 - 4X + 13$$

$$X = -b + or - SQRT(B^2 - 4AC)/2A$$

$$X = 4 + or - SQRT(-4^2 - 4(1 * 13))/2(1)$$

$$X = 4 + or - SQRT(-36)/2$$

$$X = 4 + or - 6I/2$$

$$X = 2 + 3I$$

$$X = 2 - 3I$$

Roots are 2-3I and 2+3I

Summary: For this problem I knew how to start, i just plugged it into the quadratic equation and got my roots.

Page 217 Question 26 Find all of the zeros of the polynomial then completely factor it over the real numbers and completely factor it over the complex numbers

$$F(X) = X^2 - 2X + 5$$

$$X = -b + or - SQRT(B^2 - 4AC)/2A$$

$$X = 2 + or - SQRT(-2^2 - 4(1 * 5))/2A$$

$$X = 2 + or - SQRT(-16)/2$$

$$X = 2 + or - 4I/2$$

$$X = 1 + 2I$$

$$X = 1 - 2I$$

roots are 1-2I and 1+2I

Summary: This problem was not too bad, just plugging into the quadratic formula and solving for the roots.

Page 217 Question 28 Find all of the zeros of the polynomial then completely factor it over the real numbers and completely factor it over the complex numbers

$$F(X) = X^3 - 2X^2 + 9X - 18$$

$$X^3 - 2X^2 + 9X - 18/X - 2$$

$$X^2 + 9$$

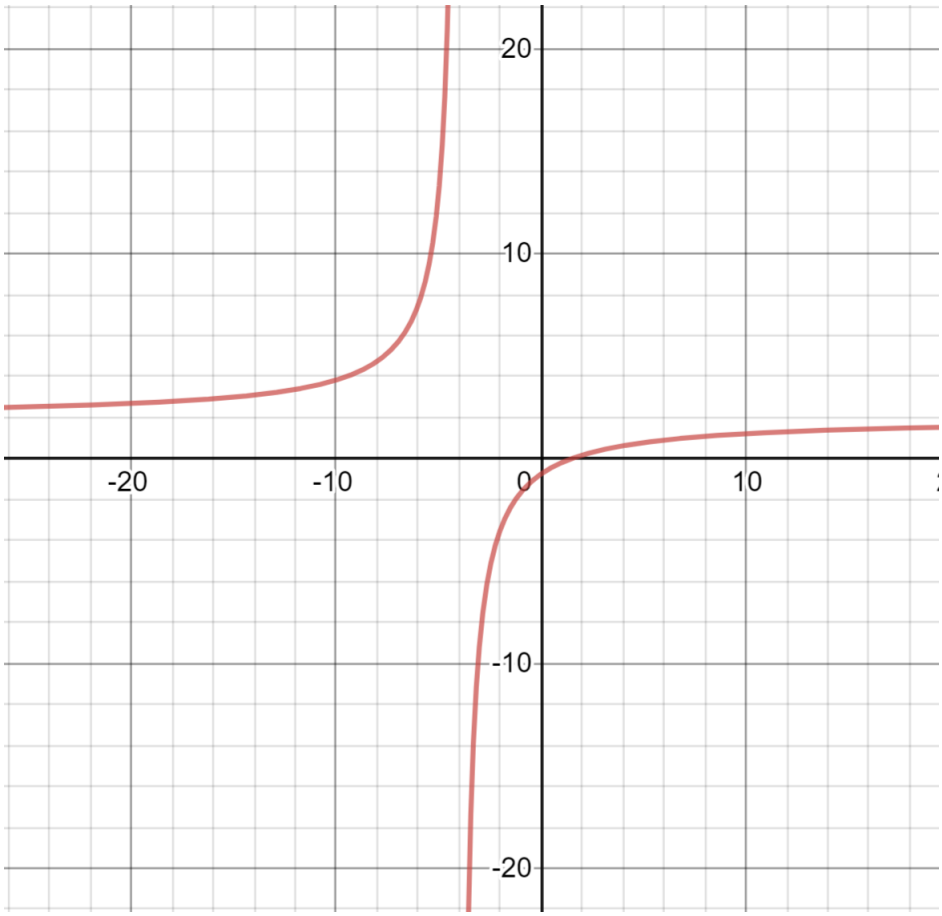
roots are 3I, -3I, and 2

Summary: This problem was not too difficult, I just did the real number theorem and solved for the roots.

Page 234 Question 5 For each function, find the horizontal intercepts, the vertical intercept, the vertical asymptotes, and the horizontal asymptote. Use that information to sketch a graph

$$2x - 3/X + 4$$

Horizontal Asymptote is 2
Vertical Asymptote is -4
The X intercept is (3/2,0)
The Y intercept is (0,-3/4)

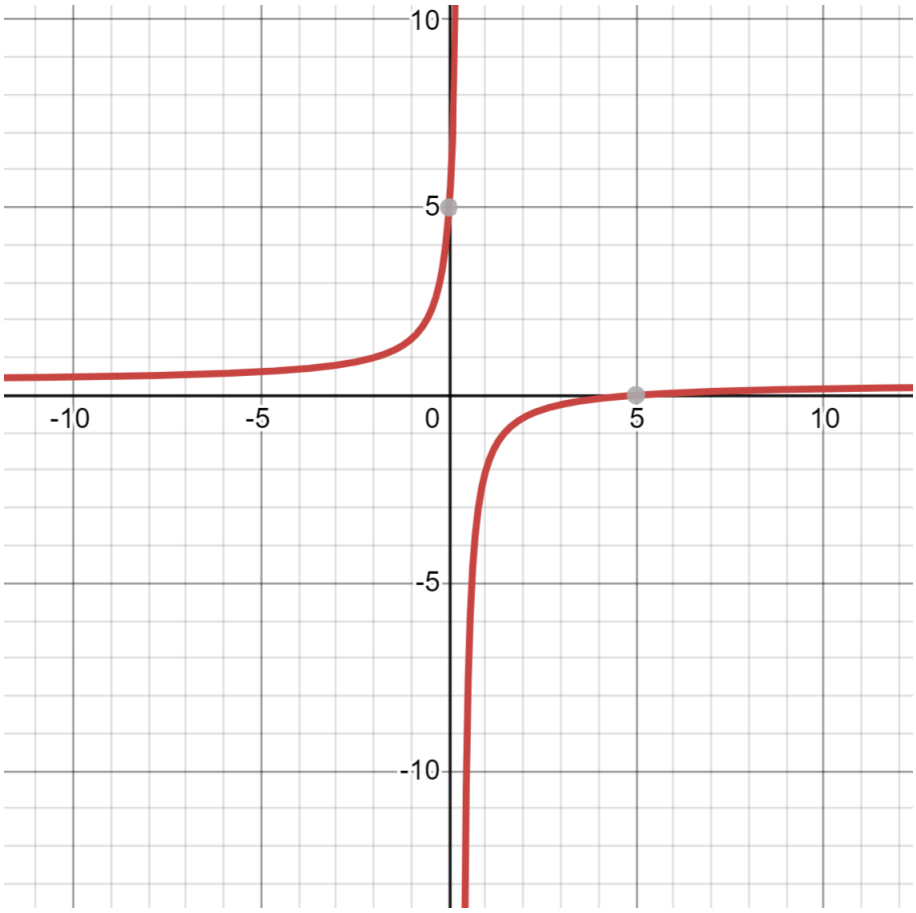


Summary: This problem was tricky because almost everything in this type of problem was new to me so I am getting used to learning how to solve it.

Page 234 Question 6 For each function, find the horizontal intercepts, the vertical intercept, the vertical asymptotes, and the horizontal asymptote. Use that information to sketch a graph

$$(X-5)/(3X-1)$$

Vertical Asymptote at 1/3
horizontal Asymptote at 1/3
X intercept at (5,0)
y intercept at (0,5)



Summary: I am getting used to finding all these and graphing them. I do not quite understand exactly what an asymptote is but I know how to get it and graph it.

Page 245 Question 1 For each function, find a domain on which the function is one-to-one and non-decreasing, then find an inverse of the function on this domain.

$$F(X) = (X - 4)^2$$

The function is 1 to 1 from (4,0) to infinity

$$F - 1(X) = SQRT(X + 4)$$

summary:This problem was tricky because there was a lot of vocabulary I did not know but the video lessons on the class website helped me a lot.

Page 245 Question 2 For each function, find a domain on which the function is one-to-one and non-decreasing, then find an inverse of the function on this domain

$$F(X) = (X + 2)$$

The function is 1 to 1 and increasing from (-2,0) to infinity

$$F - 1(X) = SQRT(X - 2)$$

Summary: I did not have a lot of problems with this, once I learned how to do it I realized it is not too difficult.

Page 245 Question 7 Find the inverse of the function

$$F(X) = 9 + SQRT(4X - 4)$$

$$F - 1(X) = ((X - 9)^2/4) + 1$$

Summary: This problem was not too hard just plugging in and solving

Page 245 Question 17 Police use the formula v=SQRT20L to estimate the speed of a car,v, in miles per hour, based on the length, L, in feet, of its skid marks when suddenly braking on a dry, asphalt road.

At the scene of an accident, a police officer measures a car's skid marks to be 215 feet long. Approximately how fast was the car traveling?

$$V = SQRT20(215)$$

$$V = SQRT4300$$

$$V = 65.5$$

The car was going around 65 mph.

Summary: This problem was not bad, just plugging in numbers to an equation and solving.

Page 246 Question 21 A drainage canal has a cross-section in the shape of a parabola. Suppose that the canal is 10 feet deep and 20 feet wide at the top. If the water depth in the ditch is 5 feet, how wide is the surface of the water in the ditch?

$$F(X) = .1X^2$$

There will be 10 feet across of water

Summary: This problem was not too bad, I found the equation and just found where five was.