Unit 6 Activity Draft

Note: Need vertex of parabola problems for 4-2.

Couch them in many ways: Given factorization, find factorization, equations not equal to 0

Get 107: What does = sign mean?

Go backwards in long division: Start with result.

If r = 5, when divide by x-3, what is f(3)?

Given roots and f(6)=5, what is f(x)

**6-1-1 What are the zeros of a function?**

S-Z p. 183 2.2: Several abs. value equations

ORCCA 1.8; p. I-72 (Several like it): The price of a washing machine after 25% discount is $172.50. What was the original price of the washing machine (before the discount was applied)? Assume the washing machine’s price before the discount is p dollars. Write an equation to model this scenario. There is no need to solve it. (ORCCA 1.8: Starts with G&C linear with table)

**6-1-2 What does the equals sign mean (and not mean)?**

Math 107 activity

**6-2-1 Factoring quadratics and finding zeros**

APC: p. 59 1.5: HW #3-4: Find the zeros, if any, of the function y 4(x + 8) 2 − 8. 4. Find the zero(s) (if any) of the function y x 2 − 15x + 50

APC: 1.5 p. 59: HW #6: Two quadratic functions, f and g, are determined by their respective graphs in Figure 1.5.14. a. How does the information provided enable you to find a formula for f ? Explain, and determine the formula. b. How does the information provided enable you to find a formula for 1? Explain, and determine the formula. c. Consider an additional quadratic function h given by h(x) 2x 2 − 8x + 6. Does the graph of h intersect the graph of f ? If yes, determine the exact points of intersection, with justification. If not, explain why. d. Does the graph of h intersect the graph of 1? If yes, determine the exact points of intersection, with justification. If not, explain why.

Calc-Medic 2.2 : Graph ݂(ݔ) = (ݔ + 3)(ݔ − 2) on the coordinate plane and identify the following: a. X-intercept(s): b. Y-intercept: c. How many times does the curve change directions? d. How are the factors related to the x-intercepts?

ORCCA: 7.1.16 (II-115): A 16.5ft ladder is leaning against a wall. The distance from the base of the ladder to the wall is 4.5 feet. How high on the wall does the ladder reach?

ORCCA: 7.1: HW#26 : solve via square root: 26. 10 − 3(x + 1)^ 2 = −2

ORCCA: 7.2 ; II-127 HW#45 (several like it): y = √ y + 9 + 3. Also several “use quadratic formula”)

ORCCA 7.2 (II-129) HW#63: There is a rectangular lot in the garden, with 8 ft in length and 4 ft in width. You plan to expand the lot by an equal length around its four sides, and make the area of the expanded rectangle 140 ft2 . How long should you expand the original lot in four directions?

ORCCA: 7.2 (II-129) HW#65: One car started at Town A, and traveled due north at 60 miles per hour. 2 hours later, another car started at the same spot and traveled due east at 55 miles per hour. Assume both cars don’t stop, after how many hours since the second car starts would the distance between them be 338 miles?

ORCCA: 7.2 II-130 HW#69: Currently, an artist can sell 280 paintings every year at the price of $60.00 per painting. Each time he raises the price per painting by $5.00, he sells 5 fewer paintings every year. Assume he will raise the price per painting x times, then he will sell 280 − 5x paintings every year at the price of 60 + 5x dollars. His yearly income can be modeled by the equation: i = (60 + 5x)(280 − 5x) where i stands for his yearly income in dollars. If the artist wants to earn $22,500.00 per year from selling paintings, what new price should he set?

**6-2-2 Factoring higher degree polynomials**

Include “trick problem” of factored form = 12.

FM 5.2: Polynomial long division (div. by linear later in document)

FM 5.2: If x=3 is a zero of ݂ሺݔሻ, what else can we conclude? 10. (als0 later in document)Given the graph of (quartic) ݂ሺݔሻ ൌ 3ݔସ െ 8ݔଷ െ 12ݔଶ ൅ 24ݔ ൅ 9 to the right, use your knowledge of the factor theorem to find the exact values of all zeros of the function. List them from smallest to largest. (For 6-2-3?)

FM 5.2: Is (x-11) a factor of ሺ3ݔସ െ 33ݔଷ െ 17ݔଶ ൅ 187ݔ െ 11ሻ? (For 6-2-3?)

FM 5.2: If x+1 is a factor of 2ݔହ ൅ 2ݔସ െ 5ݔଷ െ 5ݔଶ െ 3ݔ െ 3, what are all the factors of ݂ሺݔሻ. (For 6-2-3?)

FM 5.2; Show in 2 ways that n + 1 is a factor of 6n^3 + 6n^2. (For 6-2-3?)

FM 5.2: During Mr. Brust’s annual visit to the scrapbooking convention, he took a 20 by 40 inch piece of cardboard and put pretty flowers on it. He then realized it was possible to make a box with a hinged lid by cutting out six squares, ݔ inches on a side, from each corner and the middle, and then the ends and sides will be folded up to form the box and its lid (see figure). We want the box to have a volume of 625 cubic inches. One possible solution would be if the cutout was 5 inches. What other value of ݔ would result in a box with a volume of 625 cubic inches. (Hint: you will need to use the quadratic formula at some point.)

Active Reading: 9.2.18: Graph given of polynomial. Complete the statement below with a number:

The polynomial will have different linear factors.

Now write the formula for the polynomial.

f(x)=

APC: 5.2 p. 272 HW #5: Estimate the zero(s) of f (x) x 4 + 16x 3 + 93x 2 + 231x + 206

APC 5.2. p. 272 HW #7: Suppose f (x) (5 − 6x)(2x − 4) 2 . (a) Find the roots of f (x). (b) As x → ∞, f (x) → (b) As x → −∞, f (x) →

**6-2-3 Interpreting zeros of polynomials**

Active Reading: 9.2.28: Geogebra: Adjust power of (x-1) in x^2(x-1)^k. 9.2.30: (multiplicities): Given graph of quintic, find formula.

Active Reading 9.4.20: The graph below shows a polynomial y=f(x).

Which of the following options could be the formula for f(x)?

(x+1)(x−1)(x−3)  
 (x+1)2(x−1)(x−3)  
 (x+1)2(x−1)(x−3)2  
 (x+1)2(x−1)2(x−3)2

Active Reading 9.4.22 Geogebra: In this problem, we will make a rough sketch of the graph of the polynomial:

f(x)=x(x+3)(x−2)2

First, we know that the x-intercepts are at x=0, x=−3 and x=2.

Next, in expanded form, the leading term would be x4. This tells us the end-behavior of the graph.

Finally, the multiplicity of the roots tells us whether the graph crosses or bounces off of the x-axis.

In the graph below, use the slider to show steps for graphing this function.

Active Reading 9.4 HW #4: Given the following table of values, what is the minimum number of roots that f(x) can have?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| x | -4 | -2 | 0 | 2 | 4 |
| f(x) | -7 | 5 | -6 | 8 | 7 |

f(x) has at least root(s).

Active Reading: 9.4 HW #5 (#6, 7 is in factored form and same thing):

Determine the end behavior of the following polynomial function:

f(x)=18+17x6−13x9−16x13

The leading term of the polynomial is   
 The degree of f(x) is   
 The leading coefficient is

The end behavior of the polynomial f(x) is of the form:

A  
 B  
 C  
 D

where:

Active Reading 9.4: HW #16:

Find a formula for the polynomial of least degree through the points shown in the graph.  
   
f(x)= [help (formulas)](https://webwork-ptx.aimath.org/)

Active Reading 9.4 HW #18:

The graph below is a polynomial function in the form f(x)=(x−a)2(x−b)(x−c). Find suitable unique real numbers a, b, and c that describe the graph.

Active Reading 9.4 HW #20: Given that

f(x)=−32(x−1)2(x+4)

determine which of the above (4) graphs is the graph of f.

APC 5.2 p. 273 HW #10: In each following question, find a formula for a polynomial with certain properties, generate a plot that demonstrates you’ve found a function with the given specifications, and write several sentences to explain your thinking. (a) A quadratic function q has zeros at x 7 and x 11 and its y-value at its vertex is 42. (b) A polynomial r of degree 4 has zeros at x 3 and x 5, both of multiplicity 2, and the function has a y-intercept at the point (0, 28). (c) A polynomial f has degree 11 and the following zeros: zeros of multiplicity 1 at x 3 and x 5, zeros of multiplicity 2 at x 2 and x 3, and a zero of multiplicity 3 at x 1. In addition, limx→∞ f (x) −∞. (d) A polynomial 1 has its graph given in Figure 5.2.16 below. Determine a possible formula for 1(x) where the polynomial you find has the lowest possible degree to match the graph. What is the degree of the function you find?

Calc-Medic: 2.2: Graph ݃(ݔ) = (ݔ − 2)(ݔ − 2)(ݔ + 2) on the coordinate plane and identify the following: a. X-intercept(s): b. Y-intercept: c. How many times does the curve change directions? d. What is different about the behavior of the graph at ݔ = 2 and at ݔ− = 2? Why do you think this happens?

Calc-Medic 2.2; Sketch the graph of a polynomial with zeros at -1, 2 (with a multiplicity of 2), and 4 and a y-intercept at -5.

Calc-Medic 2.7: Consider the polynomial function , where *c* is an unknown real number. If is a factor of this polynomial, what is the value of *c*?

MFG: 7.2, 7.28 Without graphing, how can you tell that the polynomial p(x)=(x2+1)(x2+2) has no x-intercepts?

A) It is quartic.  
 B) All of its coefficients are positive.  
 C) It cannot be factored further.  
 D) It has no turning points.

**6-3-1 Rational function zeros**

FM 6.1: several rational equations, but not emphasizing zeros. #5 at end: quad/lin = linear.

APC 5.5 p. 301 HW#2: Find a possible formula for the function graphed below. The x-intercept is marked with a point located at (1, 0), and the y-intercept is marked with a point located at (0, −0.25). The asymptotes are y −1 and x 4. Give your formula as a reduced rational function.

APC 5.5 p. 303 HW #7; Find a formula for a rational function that meets the stated criteria, with justification. If no such formula is possible, explain why. a. A rational function r(x) in the form r(x) k x−a + b so that r has a horizontal asymptote of y − 3 7 , a vertical asymptote of x 5 2 , and r(0) 4. b. A rational function s(x) that has no horizontal asymptote, has zeros at x −5 and x 3, has a single vertical asymptote at x −1, and satisfies limx→∞ s(x) −∞ and limx→−∞ s(x) +∞. c. A rational function u(x) that is positive for x < −4, negative for −4 < x < −2, negative for −2 < x < 1, positive for 1 < x < 5, and negative for x > 5. The only zeros of u are located at x −4 and x −2. In addition, u has a hole at x 4. d. A rational function w(x) whose graph is shown in Figure 5.5.12.

ORCCA: (extraneous Solutions): 12.5 III-176: Solve for z in z + 1 z−4 = z−3 z−4 .

ORCCA: 12.5 HW#71: A river flows at 7 miles per hour. A boat traveled with the current from Town A to Town B, which are 260 miles apart. Then, the boat turned around, and traveled against the current to reach Town C, which is 160 miles away from Town B. The second leg of the trip (Town B to Town C) took the same time as the first leg (Town A to Town B). During this whole trip, the boat was driving at a constant still-water speed. Answer the following question: During this trip, the boat’s speed on still water was miles.

**6-3-2 Zeros of functions with roots.**

**6-3-3 Zeros of exponential functions**

Rigged-Up problems like 11150: No logs needed

Which equations can be solved with logs?

S-Z 6.3: p. 451: Example 6.3.1: Several equations, including quad in disguise after making adjustment (#6).

S-Z 6.3: p. 452: e^x/(e^x-4) < 3. Need sign chart.(or graph?). p. 454: the temperature of coffee T (in degrees Fahrenheit) t minutes after it is served can be modeled by T(t) = 70 + 90e −0.1t . When will the coffee be warmer than 100◦F?

APC; 5.2 p. 272 HW #9; Consider the (non-polynomial) function r(x) e ^(−x 2) (x 2 + 1)(x − 2)(x − 3). (a) What are the zeros of r(x)? (Hint: is e □ ever equal to zero?) (b) Construct a sign chart for r(x). (c) Plot r(x) in Desmos. Is the sign and overall behavior of r obvious from the plot? Why or why not? 272 5.2 Polynomials (d) From the graph, what appears to be the value of limx→∞ r(x)? Why is this surprising in light of the behavior of f (x) (x 2 + 1)(x − 2)(x − 3) as x → ∞?