Chapter 8 Closure What have I learned?

Reflection and Synthesis

The activities below offer you a chance to reflect about what you have learned during this chapter. As you work, look for concepts that you feel very comfortable with, ideas that you would like to learn more about, and topics you need more help with. Look for connections between ideas as well as connections with material you learned previously.

1. TEAM BRAINSTORM

What have you studied in this chapter? What ideas were important in what you learned? With your team, brainstorm a list. Be as detailed as you can. To help get you started, a list of Learning Log entries and Math Notes boxes are below.

What topics, ideas, and words that you learned *before* this chapter are connected to the new ideas in this chapter? Again, be as detailed as you can.

How long can you make your list? Challenge yourselves. Be prepared to share your team's ideas with the class.

Learning Log Entries

- Lesson 8.1.1 – Graphing Polynomials
- Lesson 8.3.2 – Factors and Roots of Polynomial Functions

Math Notes

- Lesson 8.1.1 – Polynomials, Degree, Coefficients
- Lesson 8.1.2 – Roots and Zeros
- Lesson 8.1.3 – Notation for Polynomials
- Lesson 8.2.1 – Imaginary and Complex Numbers
- Lesson 8.2.2 – The Discriminant and Complex Conjugates
- Lesson 8.2.3 – Graphing Complex Numbers
- Lesson 8.3.1 – Polynomial Division
- Lesson 8.3.2 – Polynomial Theorems
- Lesson 8.3.3 – Factoring Sums and Differences

2. MAKING CONNECTIONS

Below is a list of the vocabulary used in this chapter. Make sure that you are familiar with all of these words and know what they mean. Refer to the glossary or index for any words that you do not yet understand.

coefficient	**complex numbers**	**conjugate**
degree	**discriminant**	**factor**
imaginary numbers	**integral roots**	**polynomial**
quotient	**real number**	**remainder**
roots of a function	**solution**	**x-intercept**
zeros of a function		

Make a concept map showing all of the connections you can find among the key words and ideas listed above. To show a connection between two words, draw a line between them and explain the connection. A word can be connected to any other word as long as you can justify the connection. For each key word or idea, provide an example or sketch that shows the idea.

While you are making your map, your team may think of related words or ideas that are not listed here. Be sure to include these ideas on your concept map.

3. PORTFOLIO: EVIDENCE OF MATHEMATICAL PROFICIENCY

This section gives you an opportunity to show growth in your understanding of key mathematical ideas over time as you complete this course.

Part 1: You may have done this in a previous chapter. You have grown mathematically since then. Be sure to include everything you have learned since the last time you did this problem.

How many different kinds of graphs can you create that have:

i. No x-intercepts?
ii. One x-intercept?
iii. Two x-intercepts?
iv. Three or more x-intercepts?

For each type of graph, show a sketch, label the key points, and give its equation. Make sure that each graph you give as an example represents a different family and describe the family in words or with a general equation. Show how to calculate the$x$-intercepts of each of your sample graphs.

Part 2: Compare your responses to this "Growth Over Time" problem. Write an evaluation of your growth based on your responses. Consider each of the following questions as you write your answer.

- What new concepts did you include the second time you did the problem? In what ways was your response better than your first attempt?
- If you did the problem three times, how was your final version different from the first two? What new ideas did you include?
- Did you omit anything in your later versions that you used in one of the earlier versions? Why did you omit it?
- Rate your attempts by making three bars like the ones below and shading each bar to represent how much you knew on each attempt.
- Is there anything you want to add to your current version? If so, add it and keep this version for future reference.

First Attempt:	
Second	
Final Attempt:	

4. WHAT HAVE I LEARNED

Most of the problems in this section represent typical problems found in this chapter. They serve as a gauge for you. You can use them to determine which types of problems you can do well and which types of problems require further study and practice. Even if your teacher does not assign this section, it is a good idea to try these problems and find out for yourself what you know and what you still need to work on.

Solve each problem as completely as you can. The table at the end of the closure section has answers to these problems. It also tells you where you can find additional help and practice with problems like these.

CL 8-178. Decide if each of the following equations is a polynomial. If it is, state the degree. If it is not, explain how you know.

a. $f(x) = 3x^3 - 2x + 5$

b. $y = 0.25x^7 - 5x$

c. $y = 3^x - x^2$

d. $f(x) = x^2 - \sqrt{x} + 2$

e. $Q(x) = 3(x - 4)^2 (x + 2)$

f. $y = x^2 - 3x + 5 - \frac{2}{x-2}$

CL 8-179. Where do the graphs of each of the following functions cross the x-axis?

a. $f(x) = 3(x - 2)^2 - 3$

b. $f(x) = (x - 19)^2(x + 14)$

CL 8-180. Write a polynomial equation for a graph that passes through the point (1, 56) and has three$x$-intercept: (–3, 0), (2, 0), and (5, 0).

CL 8-181. Decide if each of the following functions has real or complex roots.

a. $y = 3x^2 + 5x + 4$

b. $y = 3x^2 + 5x - 4$

CL 8-182. Make a sketch of a graph $q(x)$ such that $q(x) = 0$ would have the number and type of solutions indicated below.

a. 7 real solutions

b. 5 real and 2 complex solutions

c. 4 complex solutions

d. 2 complex and 4 real solutions

CL 8-183. Sketch graphs of each of the following polynomial functions. Be sure to label the x- and the y-intercepts of each graph.

a. $y = x(2x + 3)(2x - 5)$

b. $y = (11 - 2x)^2(x - 2)$

CL 8-184. Simplify each expression.

a. $(3 + 4i) + (7 - 2i)$

b. $(3 + 5i)^2$

c. $(7 + i)(7 - i)$

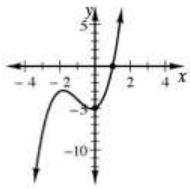
d. $(3i)(2i)^2$

e. i^3

f. i^{32}

CL 8-185. Divide: $(2x^3 + x^2 - 19x + 36) \div (x + 4)$

CL 8-186. The graph of $f(x) = x^3 + 3x^2 + x - 5$ is shown at right. Use it to determine all real and complex roots.



CL 8-187. The roots of a quadratic polynomial are given below. Find a possible quadratic equation in standard form.

a. $x = 2i$, $x = -2i$

b. $x = 2 + \sqrt{3}$, $x = 2 - \sqrt{3}$

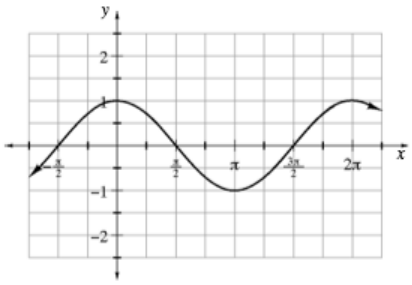
CL 8-188. CFor each equation determine the amplitude, period, locator point, and sketch part of the graph.

a. $y = 3\cos(2x)$

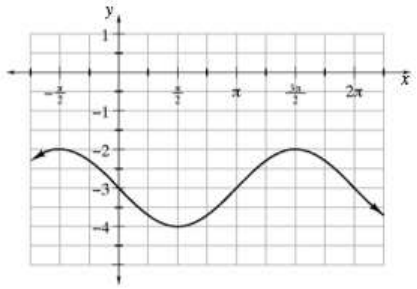
b. $y = \tan(x - \frac{\pi}{2})$

CL 8-189. Write an equation for each of the following graphs. If you have a graphing calculator, use it to check your equation (be sure to set your window to match the picture).

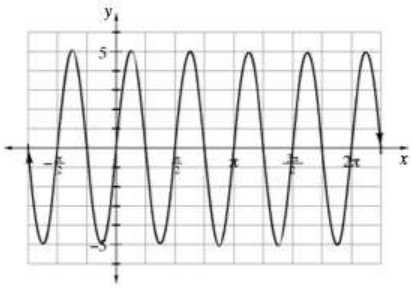
a.



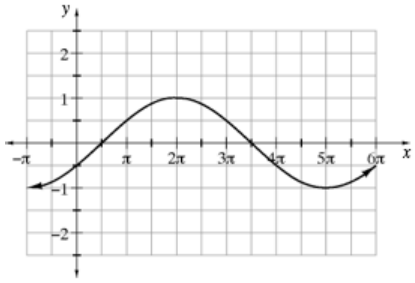
b.



c.



d.



CL 8-190. Use the system below to answer each question.

$$y = 2x$$
$$y = x^2 + 5$$

a. Without graphing, what is the solution to the system?

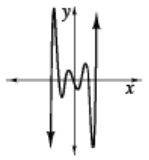
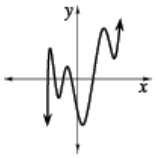
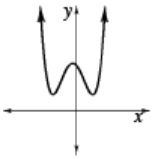
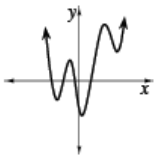
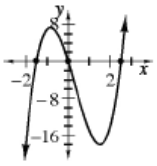
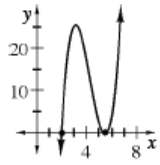
b. What does the solution to the system tell you about the graphs?

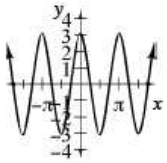
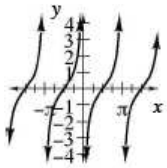
CL 8-191. Check your answers using the table at the end of this section. Which problems do you feel confident about? Which problems were hard? Have you worked on problems like these in math classes you have taken before? Use the table to make a list of topics you need help on and a list of topics you need to practice more.

Answers and Support for Closure Activity #4
What Have I Learned?

Note: MN = Math Note, LL = Learning Log

Problem	Solutions	Need Help?	More Practice
CL 8-178.	a. Yes; degree 3 b. Yes; degree 7 c. No; it contains an exponent of x d. No; it contains a non-integer exponent, $\frac{1}{2}$ e. Yes; degree 3 f. No; it contains a term that is a fraction with x in the denominator	MN: 8.1.1 and8.1.3	Problems 8-9, 8-17, 8-28, 8-39, and 8-55
CL 8-179.	a. $x = \pm\sqrt{3} + 2$ b. $x = 19$ and $x = -14$	Lesson 8.1.1and 8.1.2 MN: 8.1.2	Problems 8-19, 8-20, 8-21, 8-36, 8-37, 8-106,8-125, 8-132, and 8-169
CL 8-180	$y = 3.5(x + 3)(x - 2)(x - 5)$	Section 8.1	Problems 8-38, 8-50, 8-56, and 8-57
CL 8-181.	a. complex roots	Lessons 8.2.1and 8.2.2	Problems 8-88, 8-110, and 8-172

	b. real roots	MN: 8.2.2 and8.3.2	
CL 8-182.	a.  b.  c.  d. 	Sections 8.1 and8.2 LL: 8.1.1	Problems 8-104, 8-105, and 8-170
CL 8-183.	a.  b. 	Lessons 8.1.1and 8.1.2 LL: 8.1.1	Problems 8-8, 8-35, and 8-107
CL 8-184.	a. $10 + 2i$ b. $-16 + 30i$ c. 50 d. $-12i$ e. $-i$ f. 1	Lesson 8.2.1 MN: 8.2.1	Problems 8-76, 8-111, 8-141, 8-149, and 8-156
CL 8-185.	$2x^2 - 7x + 9$	Lesson 8.3.1 MN: 8.3.1	Problem 8-124
CL 8-186.	a. $x = 1, -2 \pm i$	Lesson 8.3.2 LL: 8.3.2	Problems 8-120, 8-121, 8-124, 8-138, 8-148, and8-154
CL 8-187.	a. $y = x^2 + 4$ b. $y = x^2 - 4x + 1$	Sections 8.1 and8.2 MN: 8.1.2 and8.3.2 LL: 8.3.2	Problems, 8-87, 8-139, 8-147, and 8-176
CL 8-188.	a. Locator: (0, 3)	Chapter 7 MN: 7.2.4 LL: 7.2.4	Problems 7-141, 7-144, 7-159, 8-14, 8-94, 8-146,8-153, and 8-177

	Amplitude: 3 Period: π  b. Locator: $(\frac{\pi}{2},0)$ Period: π There is no amplitude. 		
CL 8-189.	a. $y = \cos x$, $y = \sin(x + \frac{\pi}{2})$ or $y = -\sin(x - \frac{\pi}{2})$ b. $y = -3 - \sin x$ c. $y = 5 \sin 4x$ d. $y = \sin \frac{1}{3}(x - \frac{\pi}{2})$	Chapter 7 MN: 7.2.4 LL: 7.2.4	Problems 7-129, 8-62, and 8-94
CL 8-190.	a. $(1 \pm 2i, 2 \pm 4i)$ b. The graphs do not intersect.	Lesson 8.2.1	Problems 8-11, 8-68, 8-69, and 8-161