Review

Student Text Pages
74 to 77

Suggested Timing
45–60 min

Tools
- grid paper
- graphing calculator

Related Resources
- G–1 Grid Paper
- BLM 1–18 Chapter 1 Review

Study Guide

Use the following study guide to direct students who have difficulty with specific questions to appropriate examples to review.

Question	Section(s)	Refer to
1	1.1	Example 1 (page 7)
2	1.1	Example 2 (pages 8–9)
3	1.1	Example 3 (page 9)
4	1.2	Example 1 (pages 19–20)
5	1.2	Example 2 (pages 20–21)
6	1.2	Example 3 (pages 22–23)
7	1.2	Example 3 (pages 22–23)
8	1.2	Example 3 (pages 22–23)
9	1.3	Example 1 (page 33)
10	1.3	Example 2 (pages 34–35)
11	1.3	Example 1 (page 33), Example 2 (pages 34–35)
12	1.3	Example 3 (page 37)
13	1.3	Example 1 (page 33), Example 2 (pages 34–35)
14	1.4	Example 1 (page 46), Example 2 (page 47)
15	1.4	Example 1 (page 46), Example 2 (page 47)
16	1.5	Introduction (page 53)
17	1.5	Example 1 (pages 56–57)
18	1.6	Example 2 (pages 68–69)

Problem Wrap-Up

Student Text
Page 77

Suggested Timing
30–50 min

Tools
- grid paper
- computer with *The Geometer's Sketchpad®*

Related Resources
- G–1 Grid Paper
- T–2 *The Geometer's Sketchpad®* 4
- BLM 1–19 Chapter 1 Problem Wrap-Up Rubric

Summative Assessment
- Use **BLM 1–19 Chapter 1 Problem Wrap-Up Rubric** to assess student achievement.

Using the Chapter Problem

Teaching Suggestions

- Have students work on the chapter problem individually or in pairs.
- Remind students to keep track of their solutions to the Chapter Problem questions.
- Discuss how the Chapter Problem questions relate to the Chapter Problem Wrap-Up.
- Though the use of technology is recommended when creating the design for the item in the Chapter Problem Wrap-Up, it is not absolutely necessary. Allow students to choose their preferred method.
- You may wish to have students begin the Chapter Problem Wrap-Up for homework, and then provide some class time for them to work on their report.
- The Chapter Problem Wrap-Up provides students with an opportunity to be creative as well as apply some of the key concepts of the chapter.
- Allow students the opportunity to provide a concrete display of the design of their item.
- You may wish to share with students the sample solution in the Teacher's Resource to help them get started. It may be helpful to point out the use of a table as an efficient way to organize the information they are required to provide for the functions in their design.
- Some designs may involve many functions and so it may be a good idea to limit the number of equations for which students are required to provide information.
- When evaluating average rate of change and instantaneous rate of change, it is sufficient to calculate these by selecting points within the domain of the function.
- Provide the students with a rubric so that they know how they will be evaluated.

Level 3 Sample Response

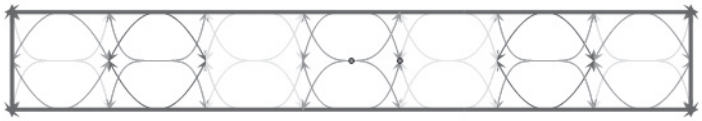
Report

Description of Item

I like jewellery, so I created a design that could be used to create a bracelet. The bracelet could be made from different coloured beads. A matching belt could also be created with this design.

Drawing of Design

I used GSP to create the design shown.



Polynomial Equations Used

The polynomial equations used in the design are listed below. I restricted the domain and used transformations of the four power functions: $y = x^2$, $y = x^3$, $y = x^4$, and $y = x^5$. The outside of the border is created with $y = -1$, $y = 1$, $x = -7$, and $x = 7$.

$f(x) = x^3$	$f_1(x) = (x - 2)^4 - 1$	$f_2(x) = -(x - 4)^2 + 1$	$h_3(x) = -(x - 6)^5$
$g(x) = 1$	$g_1(x) = -(x - 2)^4 + 1$	$g_2(x) = (x - 4)^2 - 1$	$q_3(x) = (x - 6)^5$
$h(x) = -1$	$h_1(x) = -(x + 2)^4 + 1$	$r_2(y) = -7$	
$q(x) = (x - 2)^3$	$q_1(x) = (x + 2)^4 - 1$	$s_2(y) = 7$	
$r(x) = (x + 2)^3$	$r_1(x) = (x + 4)^5$	$t_2(x) = -(x - 6)^2 + 1$	
$s(x) = -x^4 + 1$	$s_1(x) = (x - 4)^5$	$u_2(x) = (x - 6)^2 - 1$	
$t(x) = x^4 - 1$	$t_1(x) = -(x + 4)^5$	$v_2(x) = -(x + 6)^2 + 1$	
$u(x) = -x^3$	$u^1(x) = -(x - 4)^5$	$w_2(x) = (x + 6)^2 - 1$	
$v(x) = -(x + 2)^3$	$v_1(x) = -(x + 4)^2 + 1$	$f_3(x) = -(x + 6)^5$	
$w(x) = -(x - 2)^3$	$w_1(x) = (x + 4)^2 - 1$	$g_3(x) = (x + 6)^5$	

Features of Three Functions

The table provides the required information for three of the above equations.

Equations	$y = -(x + 2)^3$	$y = (x - 2)^4 + 1$	$y = -(x - 6)^5$
Domain	$-3 \le x \le -1$	$1 \le x \le 3$	$5 \le x \le 7$
Range	$-1 \le y \le 1$	$-1 \le y \le 1$	$-1 \le y \le 1$
Finite Differences	$-3! = -6$	$4! = 12$	$-5! = -120$
Symmetry	This is an odd function, so it has point symmetry about $(-2, 0)$.	This is an even function, so it is symmetrical about the line $x = 2$.	This is an odd function, so it has point symmetry about $(6, 0)$.
Transformations	The function is a transformation of $y = x^3$. i) reflection in the x-axis ii) shift 2 units left	The function is a transformation of $y = x^4$. i) shift 1 unit up ii) shift 2 units right	The function is a transformation of $y = x^5$. i) reflection in the x-axis ii) shift 6 units right
Average Rate of Change	The average rate of change between $x = -3$ and $x = -1$ is $\frac{f(-1) - f(-3)}{-1 + 3} = \frac{-1-1}{2} = -1$	The average rate of change between $x = 1$ and $x = 2$ is $\frac{2 - 1}{1 - 2} = -1$	The average rate of change between $x = 5$ and $x = 7$ is $\frac{-1 - 1}{7 - 5} = -1$
Instantaneous Rate of Change	For the instantaneous rate of change at $x = 0$, choose the interval $0 \le x \le 0.1$. $\frac{f(0.1) - f(0)}{0.1 - 0}$ $= \frac{-9.26 + 8}{0.1}$ $= -12.6$	For the instantaneous rate of change at $x = 2$, choose the interval $2 \le x \le 2.1$. $\frac{f(2.1) - f(2)}{0.1 - 0}$ $= \frac{1.0001 - 1}{0.1}$ $= 0.001$	For the instantaneous rate of change at $x = 5$, choose the interval $5 \le x \le 5.1$. $\frac{f(5.1) - f(5)}{0.1 - 0}$ $= \frac{0.59049 - 1}{0.1}$ $= -4.095$

Level 3 Notes

- Design uses two or three types of polynomial functions (i.e., linear, quadratic, and cubic)
- Most polynomial equations are provided
- Item designed is fairly creative and complex/intricate
- Report is fairly well organized and thorough
- Most of the requested components about each function are provided
- Solutions contain some minor errors
- Information provided demonstrates a fairly clear understanding of how to determine finite differences, domain and range, end behaviour, symmetry, average rate of change, instantaneous rate of change

What Distinguishes Level 2

- Design uses one or two types of polynomial functions (i.e., linear, quadratic)
- Some polynomial equations are provided
- Item designed is somewhat creative and complex/intricate
- Report is somewhat organized and thorough
- Some of the requested components about each function are provided
- Solutions contain errors
- Information provided demonstrates some understanding of how to determine finite differences, domain and range, end behaviour, symmetry, average rate of change, instantaneous rate of change

What Distinguishes Level 4

- Design uses three or more types of polynomial functions (i.e., linear, quadratic, cubic, and quartic etc.)
- All polynomial equations are provided
- Item designed is very creative and complex/intricate
- Report is very well organized and thorough
- All of the requested components about each function are provided
- Solutions contain very minor or no errors
- Information provided demonstrates a very clear understanding of how to determine finite differences, domain and range, end behaviour symmetry, average rate of change, instantaneous rate of change