Name Exemplar Date Period

Chapter 1— Investigating Functions
Study Guide

LT 1.1 I can explain and demonstrate closure of polynomials using various operations. (A-APR.1)

1a) What is the simplified form of the polynomial expression shown below?

Distribute → $-x(x^3 - 4) + 3x^4 - 3x(x - 1)$

$-x^4 + 4x + 3x^4 - 3x^2 + 3x$ ← Combine like terms.

$2x^4 - 3x^2 + 7x$ ← Standard Form

b) Explain in your own words what closure means

When a function (or element) undergoes an operation on the result is within the same Element.

c) Are the following linear functions closed under multiplication?

f(x)= 2x+1 g(x)=-3x + 5

$(2x+1)(-3x+5) \Rightarrow -6x^2 + 10x - 3x + 1 \Rightarrow -6x^2 + 7x + 1$

No, the result is not linear it is a quadratic.

d) Are the following quadratic functions closed under addition?

f(x)= $3x^2+1$ g(x)=$2x^2 + 5$

$(3x^2+1) + (2x^2+5)$

$5x^2 + 6$

yes, the result is also a quadratic

LT 1.2 I can perform various operations of polynomials to find equivalent expressions. (A-APR.1)

2) A student is performing different operations on the expressions $16k^6 - 12k^4 + 2k^2$ **and** $2k^2$.

Complete the table by writing the result after performing each operation.

$\left(16k^6 - 12k^4 + 2k^2\right) + 2k^2 =$ 1 $16k^6 - 12k^4 + 4k^2$ ○ Combine like terms

$\left(16k^6 - 12k^4 + 2k^2\right) - 2k^2 =$ 2 $16k^6 - 12k^4$ ○

$\left(16k^6 - 12k^4 + 2k^2\right) \cdot 2k^2 =$ 3 $32k^8 - 24k^6 + 4k^4$ ○ Distribute

$\left(16k^6 - 12k^4 + 2k^2\right) \div 2k^2 =$ 4 $8k^4 - 6k^2 + 1$ ○ Divide

$2k^2$

$\frac{16k^6}{2k^2} - \frac{12k^4}{2k^2} + \frac{2k^2}{2k^2} \Rightarrow 8k^4 - 6k^2 + 1$

25%

LT 1.3 I can create a function that models a relationship in a context. (F-BF.1)

3) A washing machine was purchased for $256. Each year the value is 1/4 of its value the previous year.

Initial Value

Exponential

a) Enter the function, f(t), that describes the value of the washing machine, in dollars, as a function of time in years, t, after the initial purchase.

$f(t) = a(1 \pm r)^t$ $f(t) = 256(1 - .25)^t$

$f(t) = 256(.75)^t$

b) What is the value of the washing machine after 5 years of usage?

$f(5) = 256(.75)^5 \Rightarrow 60.75$

In 5 years it is worth $60.75

4) a) A tree is growing at a constant rate of 2 inches per month. If the tree height was originally 48 inches when it was first recorded, create an equation h(t) that models the scenario where h(t) is the height in inches and t is time in months.

$h(t) = mt + b$

$h(t) = 2t + 48$

Linear ($y = mx + b$)

b) What is the height of the tree after 10 months from its initial recording?

$h(10) = 2(10) + 48$

$20 + 48 = 68$

The tree will be 68 inches tall in 10 months

1.4 I can create an explicit and recursive formula that models a relationship in a context. (F-BF.1a)

5) Observe the pattern of the values and term number in the sequence. Then answer the following.

+6, +6, +6

-25, -19, -13, -7,...

Arithmetic

a) Write the explicit formula for the following sequence.

$a_n = a_1 + (n-1)d$

$a_n = -25 + (n-1)6$

$a_n = -31 + 6n$

b) Write the recursive formula for the following sequence..

$a_1 = -25$

$a_n = a_{n-1} + 6$

c) What is the value on the 11th term?

$a_{11} = -31 + 6(11) \Rightarrow a_{11} = 35$

The 11th term will produce a value of 35.

d) Which term will produce a value of 95?

$95 = -31 + 6n$

$+31 \quad +31$

$\frac{126}{6} = \frac{6n}{6}$ $n = 21$

The 21st term will produce a value of 95

5) Observe the pattern of the values and term number in the sequence. Then answer the following.

×-4 ×-4

-5, 20, -80,...

Geometric

a) Write the explicit formula for the following sequence.

$a_n = a_1(r)^{n-1} \Rightarrow a_n = -5(-4)^{n-1}$

b) Write the recursive formula for the following sequence.

$a_1 = -5$

$a_n = a_{n-1}(-4)$

c) What is the value on the 4th term?

$a_4 = -5(-4)^{4-1} \Rightarrow 320$ The 4th term will produce a value of 320.

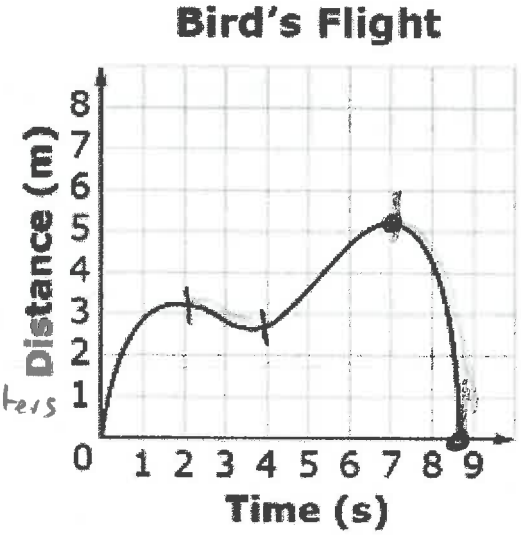
d) Which term will produce a value of -20480?

$\frac{-20480}{-5} = \frac{-5(-4)^{n-1}}{-5} \Rightarrow 4096 = (-4)^{n-1} \Rightarrow 4096 = (-4)^6 \Rightarrow n = 7$

The 7th term will produce -20480

LT 1.5 I can work with multiple representations of a function (Context, Tabular, Symbolic, Graphical) (F-IF.4)

6) A bird flies out of its nest. This graph represents the distance it flies from its nest (in meters) as a function of time (in seconds).



a) Identify the coordinate on the graph that represents the bird's greatest distance from its nest.

The Coordinate is (7, 5.2) and it means that at 7 seconds it reached its max distance of 5.2 meters

b) Identify the coordinate on the graph that represents the bird returned to its nest. Explain you choice

(8.5, 0)

The Distance is at 0 meters from its nest and that was at about 8.5 seconds

c) Give the time intervals at which the bird was returning to its nest.

Decreasing in distance at 2 - 4 seconds. and 7 to 8.5 seconds

LT 1.6 I can explain how the key features of a graph and/or table relate to a context. (F-IF.4)

7) A video camera films a professional soccer player kicking a ball. The height of the ball (in feet) is tracked as time passes (in seconds). The data is recorded in the table.

Time (seconds)	Soccer Ball Height (feet)
0	3
1	43
2	63
3	63
4	43

a) In what interval does the soccer ball reach its maximum height?

It reached its maximum height between 2-3 seconds

b) What is the initial height of the ball when it was kicked?

the initial height is 3ft which was a time 0 seconds

LT 1.7 I I can graph various functions that maintain a particular domain and/or range. (piecewise functions). (F-IF.7b)

8) Graph each piecewise function and determine specific points of discontinuity.

a) $f(x) = \begin{cases} -2x - 1, & x \le 2 \\ -x + 4, & x > 2 \end{cases}$

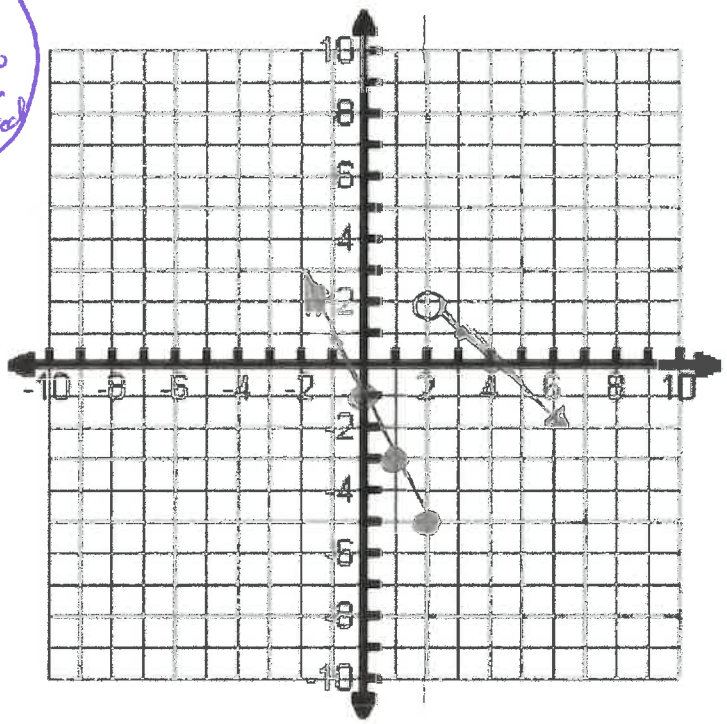
Make sure to identify open/closed points

x	f(x)
2	-5
1	-3
0	-1

closed

x	f(x)
2	2
3	1
4	0

open



b)

$$f(x)=\begin{cases}-4, & x\le -2 \quad (1)\\ x-2, & -2<x<2 \quad (2)\\ -2x+4, & x\ge 2 \quad (3)\end{cases}$$

(1)

x	f(x)
-2	-4
-3	-4
-4	-4

closed

(2)

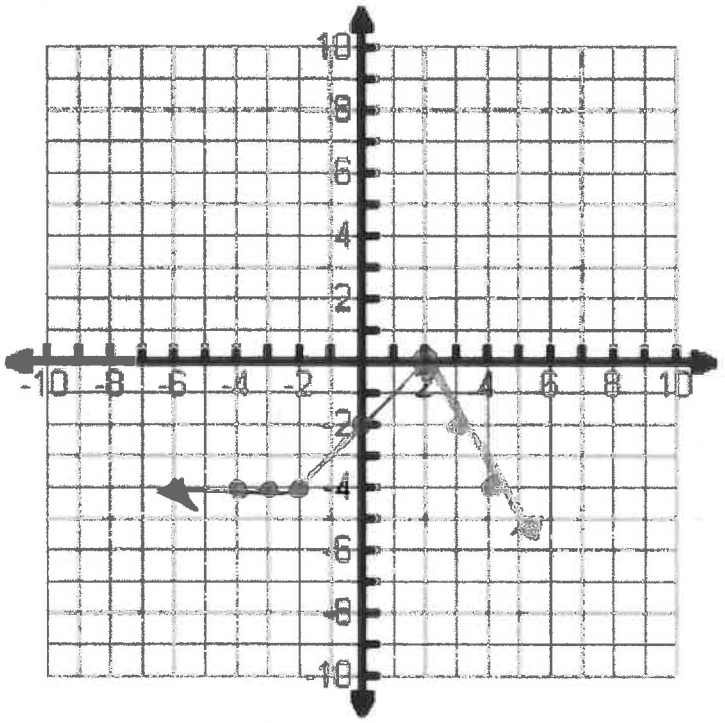
x	f(x)
-2	-4
0	-2
2	0

open

open

x	f(x)
2	0
3	-2
4	-4

closed



9) The admission rates at an amusement park are as follows.

Children 5 years old and under: free

Children between 5 years and 12 years, inclusive: $10.00

Children between 12 years and 18 years, inclusive: $25.00

Adults: $35.00

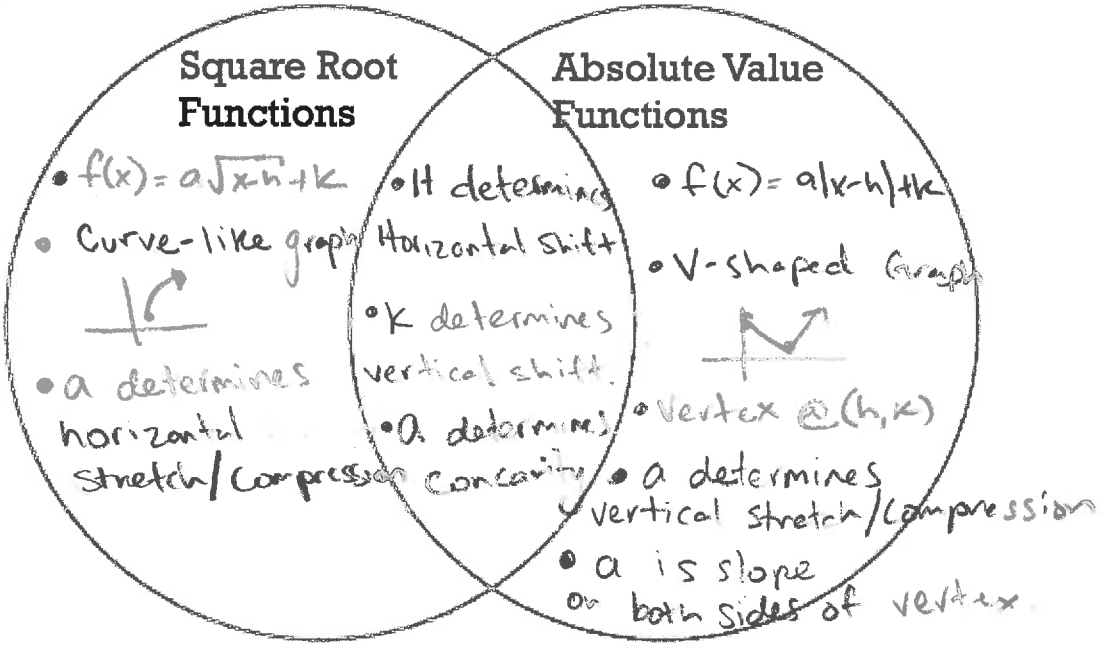
Write a piecewise function that gives the admission price for a given age.

$$P(x)=\begin{cases}0 & x\le 5\\ 10 & 5<x\le 12\\ 25 & 12<x\le 18\\ 35 & x>18\end{cases}$$

Pay close attention to inclusive ages in the scenario

LT 1.8 I can apply transformations to parent functions and identify key features. (F-IF.7b)

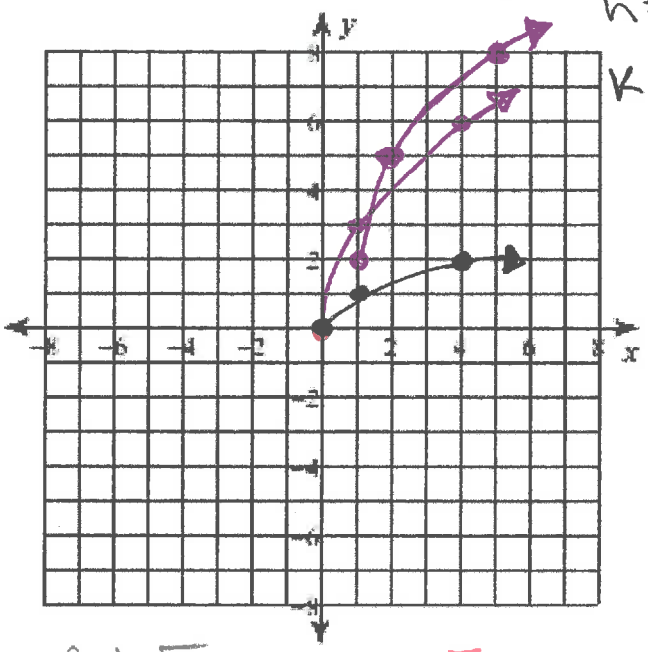
10) Create a Venn Diagram of the similarities and differences of Square Root and Absolute Value Functions. Things to keep in mind: Equation, shape of the graph, affects of a, h, & k.



`11) Graph each function:

a) $f(x) = 3\sqrt{x-1}+2$

$f(x) = a\sqrt{x-h}+k$ $a = 3$, $h = 1 \rightarrow$, $k = 2 \uparrow$



$f(x) = \sqrt{x}$

x	f(x)
0	0
1	1
4	2

$\times 3 \rightarrow$

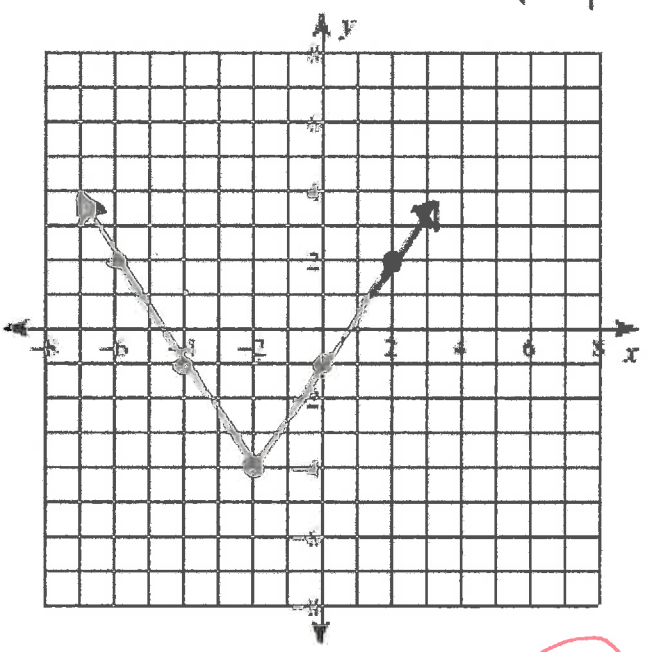
$f_2(x) = 3\sqrt{x}$

$f_2(x)$
0
3
6

$f_3(x) = 3\sqrt{x-1}+2$

b) $f(x) = \frac{3}{2}|x+2|-4$

Vertex: (h,k) (-2, -4)



a: $\frac{3}{2}$ Rise/Run

h: -2

k: -4

Slope on both sides of vertex