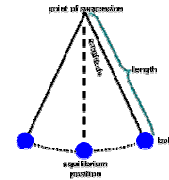


Lesson 28 – Radical Functions

Math 2 Honors - Santowski

(A) Pendulums: Periods and Lengths

- The period of a pendulum refers to.....??
- The period of a pendulum depends upon????



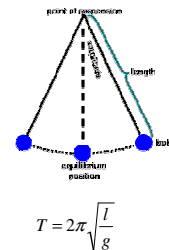
(A) Pendulums: Periods and Lengths

- From the data below, determine the nature of the relationship between the Length and Period of a pendulum

Length	1	2	4	6	8	18
Period	2.007	2.839	4.014	4.916	5.677	8.515

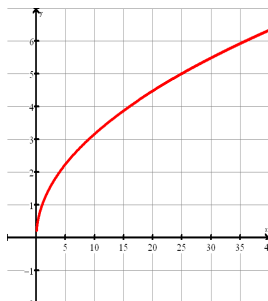
(A) Pendulums: Periods and Lengths

- The period of a pendulum refers to.....?? (Time taken for one complete cycle)
- The period of a pendulum depends upon???? The period varies directly as the square root of the length of the string



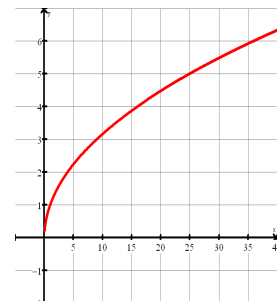
(B) The Function $f(x) = \sqrt{x}$

- We can use graphing technology to study the function $f(x) = \sqrt{x}$
- The domain is ??? WHY?
- The range is ??? WHY?
- The intercept(s) are:
- Any asymptotes?
- Increasing or decreasing?



(B) The Function $f(x) = \sqrt{x}$

- We can use graphing technology to study the function $f(x) = \sqrt{x}$
- The domain is $x \geq 0$
- The range is $y \geq 0$
- The intercept is at (0,0)
- Any asymptotes? No
- Increasing or decreasing → Increasing without bound



(B) The Function $f(x) = \sqrt{x}$

- We can use graphing technology to study the function $f(x) = \sqrt{x}$ from the perspective of its table of values
- Note that the function INPUT values are all positive real numbers
- Note that the function OUTPUT values are all positive real numbers that represent the square root of the input values

x	y
0.00000	0.00000
1.00000	1.00000
2.00000	1.41421
3.00000	1.73205
4.00000	2.00000
5.00000	2.23607
6.00000	2.44949
7.00000	2.64575
8.00000	2.82843
9.00000	3.00000
10.00000	3.16228
11.00000	3.31662
12.00000	3.46410
13.00000	3.60555
14.00000	3.74166
15.00000	3.87298
16.00000	4.00000

(C) The Root Functions $f(x) = \sqrt[n]{x}$

- The square root function is simply one of many root functions possible:
- Graph the following on a TI-84 and sketch.

$$f(x) = \sqrt[3]{x} \quad f(x) = \sqrt[4]{x}$$

$$f(x) = \sqrt[5]{x} \quad f(x) = \sqrt[6]{x}$$

$$f(x) = \sqrt[7]{x} \quad f(x) = \sqrt[8]{x}$$

- Note the similarities and/or differences that appear.

(C) The Root Functions in Exponential Form

- The root functions can be rewritten in exponent form

$$f(x) = \sqrt[3]{x} = x^{\frac{1}{3}} \quad f(x) = \sqrt[4]{x} = x^{\frac{1}{4}}$$

$$f(x) = \sqrt[5]{x} = x^{\frac{1}{5}} \quad f(x) = \sqrt[6]{x} = x^{\frac{1}{6}}$$

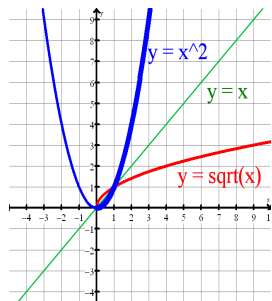
$$f(x) = \sqrt[7]{x} = x^{\frac{1}{7}} \quad f(x) = \sqrt[8]{x} = x^{\frac{1}{8}}$$

(D) The Square Root Function & Inverses

- We can study the root function as an inverse as well → it is the inverse of the squaring function $f(x) = x^2$
- So $f^{-1}(x) = x^{\frac{1}{2}}$
- As with the squaring function (x^2 or the parabola), the key "point" was the vertex → so we can "understand" a "vertex" on the root function

(D) The Square Root Function & Inverses

- Ideally, the root function is an inverse function of only part of the original parabola → the branch of $y = x^2$ where $x \geq 0$



(D) The Square Root Function & Inverses

- The other root functions as well can be understood as inverses as well → inverses of POWER functions

$$f(x) = \sqrt[3]{x} \text{ as inverse of } f(x) = x^3$$

$$f(x) = \sqrt[4]{x} \text{ as inverse of } f(x) = x^4$$

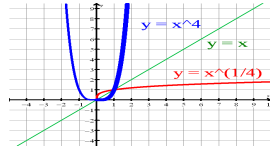
$$f(x) = \sqrt[5]{x} \text{ as inverse of } f(x) = x^5$$

$$f(x) = \sqrt[6]{x} \text{ as inverse of } f(x) = x^6$$

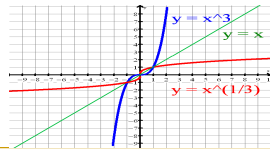
etc....

(D) The Square Root Function & Inverses

- The other root functions as well can be understood as inverses as well → inverses of POWER functions



$f(x) = \sqrt[3]{x}$ as inverse of $f(x) = x^3$
 $f(x) = \sqrt[4]{x}$ as inverse of $f(x) = x^4$
 $f(x) = \sqrt[5]{x}$ as inverse of $f(x) = x^5$
 $f(x) = \sqrt[6]{x}$ as inverse of $f(x) = x^6$
 etc....



(E) Root Functions and Transformations

- We can revisit our “transformational” function equation in the context of root functions
- $Y = a f[b(x + c)] + d$ → where a,b,c,d are
- So our equation would look like this:

$$f(x) = a\sqrt{b(x+c)} + d$$

(E) Root Functions and Transformations

- Describe the transformations of $y = x^{1/2}$ if the new equations are:

$$f(x) = -2\sqrt{x+1} + 4$$

$$g(x) = \sqrt{4x-8}$$

$$h(x) = \sqrt{4x-3} - 1$$

- Find the location of the “vertex”, state the domain and range and then sketch each transformed function

(E) Root Functions and Transformations

- Determine the equation of the inverses of:

$$f(x) = -2\sqrt{x+1} + 4$$

$$g(x) = \sqrt{4x-8}$$

$$h(x) = \sqrt{4x-3} - 1$$

- State domain and range restrictions for the inverse functions

(F) Parabolas and Their Inverses

- Determine the equation of the inverses of:

$$f(x) = x^2 - 2x$$

$$g(x) = x^2 + 3x - 4$$

- Determine the domain and range of each inverse and then graph them.

(H) Homework

- p525 # 14,15,18,23,27,34,35,47,51,52,58,63,65