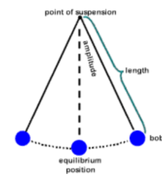
Lesson 30 – Radical Functions

Math 2 Honors - Santowski

(A) Pendulums: Periods and Lengths

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



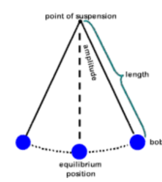
(A) Pendulums: Periods and Lengths

- 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

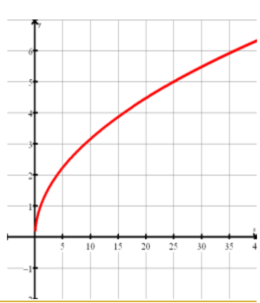
- The period of a pendulum refers to…..?? (Time taken for one complete cycle)
- The period of a pendulum depends upon ……???? The period varies directly as the square root of the length of the string



$$T = 2\pi\sqrt{\frac{l}{g}}$$

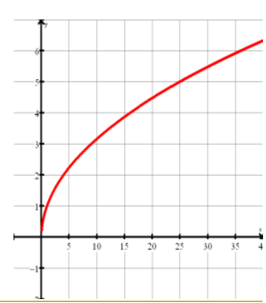
(B) The Function $f(x) = \sqrt{x}$

- We can use graphing technology to study the function f(x) = √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) = √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) = √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.

$$f(x) = \sqrt[3]{x} \qquad f(x) = \sqrt[4]{x}$$
$$f(x) = \sqrt[5]{x} \qquad f(x) = \sqrt[6]{x}$$
$$f(x) = \sqrt[7]{x} \qquad f(x) = \sqrt[8]{x}$$

- Note the similarities and/or differences that appear.

(C) The Root Functions in Exponential Form

- The root functions can be rewritten in exponent form

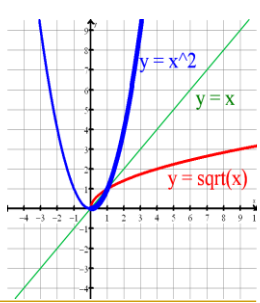
$$f(x) = \sqrt[3]{x} = x^{\frac{1}{3}} \qquad f(x) = \sqrt[4]{x} = x^{\frac{1}{4}}$$
$$f(x) = \sqrt[5]{x} = x^{\frac{1}{5}} \qquad f(x) = \sqrt[6]{x} = x^{\frac{1}{6}}$$
$$f(x) = \sqrt[7]{x} = x^{\frac{1}{7}} \qquad f(x) = \sqrt[8]{x} = x^{\frac{1}{8}}$$

(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 $f^{-1}(x) = x^{½}$
- 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



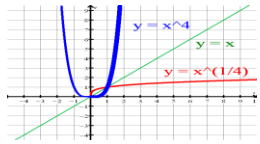
(D) The Square Root Function & Inverses

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

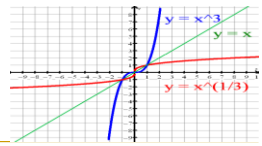
$$f(x) = \sqrt[3]{x} \text{ as inverse of } f(x) = x^3$$
$$f(x) = \sqrt[4]{x} \text{ as inverse of } f(x) = x^4$$
$$f(x) = \sqrt[5]{x} \text{ as inverse of } f(x) = x^5$$
$$f(x) = \sqrt[6]{x} \text{ as inverse of } f(x) = x^6$$
etc....

(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 = x½ 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