HS MATH 3	1.2| Domain and Range of Inverse Functions.
DATE: 8/30/19 1A	***Solidify Understanding Task*** ***Mathematics Vision Project***

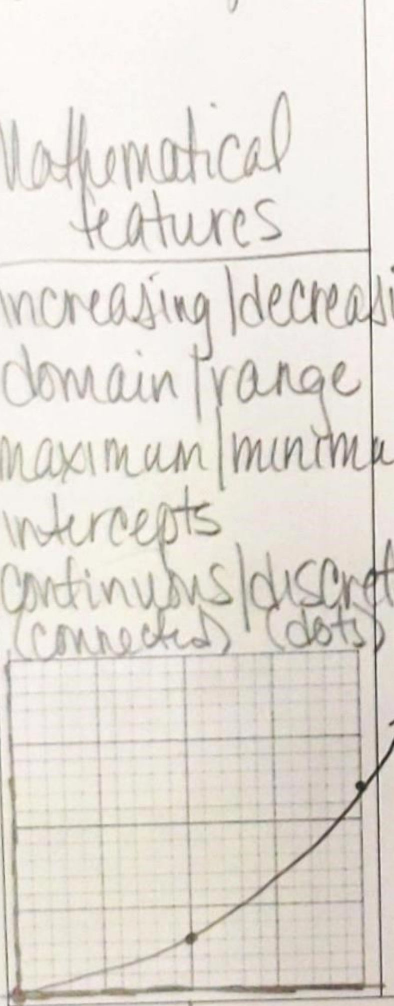
ESSENTIAL QUESTION(S): State the domain and range of an inverse function.

REVIEW:

[,] equal to
(,) not equal to

Mathematical features

- increasing/decreasing
- domain/range
- maximum/minimum
- intercepts
- continuous/discrete (connected) (dots)



NOTES:

When people first learn to drive, they are often told that the faster they are driving, the longer it will take to stop. So, when you're driving on the freeway, you should leave more space between your can and the car in front of you than when you are driving slowly through a neighborhood. Police departments and Insurance companies study the relationship between the speed of a car and the breaking distance.

1. Experiments have shown that on a smooth, dry road, the relationship between the braking distance(d) and speed(s) is given by $d(s)=0.03s^2$. Speed is given in miles/hour and the distance is in feet.
   a. How many feet should you leave between you and the car in front of you if you are driving a Ferrari at 55 mi/hr?

      $d(55)=0.03(55)^2=\boxed{90.75\text{ft}}$

   b. What distance should keep between you and the car in front of you if you are driving at 100 mi/hr?

      $d(100)=0.03(100)^2=\boxed{300\text{ft}}$

   c. If an average car about 16 feet long, about how many car lengths should you have between you and that car in front of you if you are driving 100 mi/hr? $\frac{300}{16}=18.75\approx\boxed{19\text{ cars}}$

   d. It makes sense to a lot of people if the car is moving at one speed and then goes twice as fast, the braking distance will be twice as far. Explain why or why not? our equation is quadratic

2. According to Ferrari, the maximum speed of the car is about 217mph. Use this to describe all the mathematical features of the relationship between braking distance and the speed for the Ferrari modeled by $d(s)=0.03s^2$. A graph may help for this question.

   increasing [0, 217)   domain [0, 217) ← speed
   max = none   min = (0,0)   range [0, 1412.67) ← distance
   xint & yint = (0,0)   continuous

P
E
MD
AS

undo

Inverse

$y=0.03x^2$

$\frac{x}{0.03}=\frac{0.03y^2}{0.03}$

$\sqrt{\frac{1x}{0.03}}=\sqrt{y^2}$

$\sqrt{33.3x}=y^{-1}$

Quadratic

$y=a(x-h)^2+k$

(h,k)

Square root

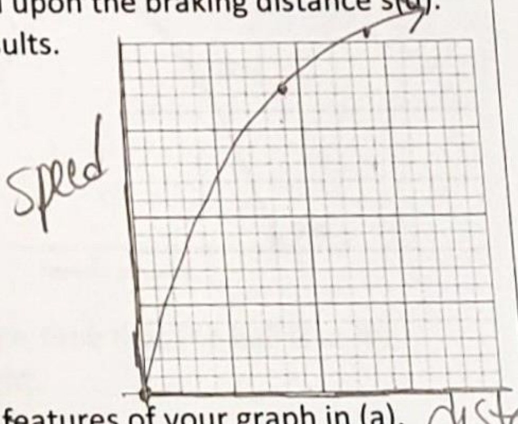
$y=a\sqrt{x-h}+k$

a (h,k)

3. Imagine you are driving in your Ferrari and suddenly hit the brakes to avoid hitting a deer in the road. You skidded to a stop and just barely missed bambi. You get out of the car to check your Ferrari and decide to measure the skid marks left by your car. You see that your braking distance was 31 ft.
   a. How fast were you going before you hit the brakes? $\frac{31}{0.03}=\frac{0.03s^2}{0.03} \rightarrow \sqrt{1033.3}=\sqrt{s^2}$ $\boxed{32\text{mph}=s}$
   b. If you didn't see the deer until you were 15 feet away, what is the fastest speed you could have been traveling and still miss the deer?

$15=0.03s^2 \rightarrow 500=s^2 \rightarrow s=\boxed{22.4\text{ mph}}$

4. Part of the job of a police officers is to investigate traffic accidents to determine what caused the accident and which driver was at fault. They measure the braking distance using skid marks and calculate speeds using the mathematical relationships.
   a. Based on our Ferrari on smooth, dry road, create a table that shows the speed the car was traveling based upon the braking distance s(d). Graph your results.



   b. Describe the features of your graph in (a). distance increasing [0, 217) Range: [0, 217) min = (0, 0) domain: [0, 1412.67) continuous Max = nope
5. What do you notice between your graphs s(d) and d(s)?

d(s) is the inverse of s(d)

6. Considering that the domain of $d(s)=0.03s^2$ for all real numbers. How does changing the domain of d(s) change the graph of the inverse of d(s)? D: [0, 217)

$d^{-1}(s)$ domain would be the range of d(s)

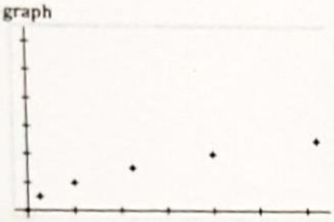
7. Is the inverse of d(s) a function? Justify your answer.

yes because the other half of the graph does not exist because we would have negatives in a square root.

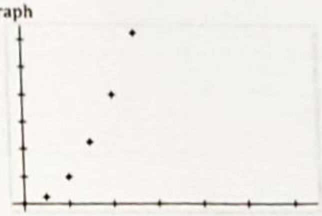
✎ **Try on your own:**

1. Two students were given a set of data to graph. Explain what the two students have done with their data.

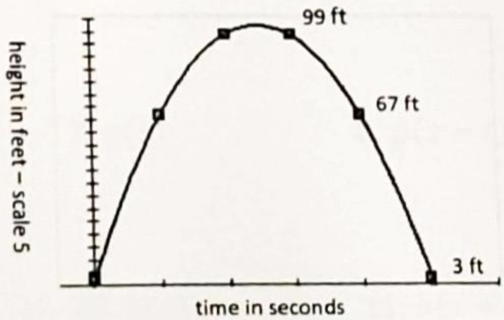
Ethan's graph



Emma's graph



2. A baseball is hit upward from a height of 3 feet with an initial velocity of 80 feet per second (about 55 mph). The graph shows the height of the ball at any given second during its flight. Use the graph below to answer the following questions.



a. Approximate the time that the ball is at its maximum height.

b. Approximate the tine that the ball hits the ground.

c. At what time is the ball 67 feet above the ground?