6.2 Time's Running Out!

A Develop Understanding Task

https://pixabay.com/en/photos/wave/

Last lesson we were introduced to Family Kingdom Amusement Park in Myrtle Beach and how they needed to be prepared for the chance of a Tsunami. We learned how we could determine how fast a wave was moving, but how can we use this to help them prepare?

You may remember from science that $r = \frac{d}{t}$ where *d* is distance, *t* is time, and *r* is rate. The earthquake that we detected was at 22° 27' 06" N and 54° 02'47" W which is 27,393.82 km from Family Kingdom Amusement Park. This means we can model the time vs. rate with the equation $r = \frac{27393.82}{t}$.

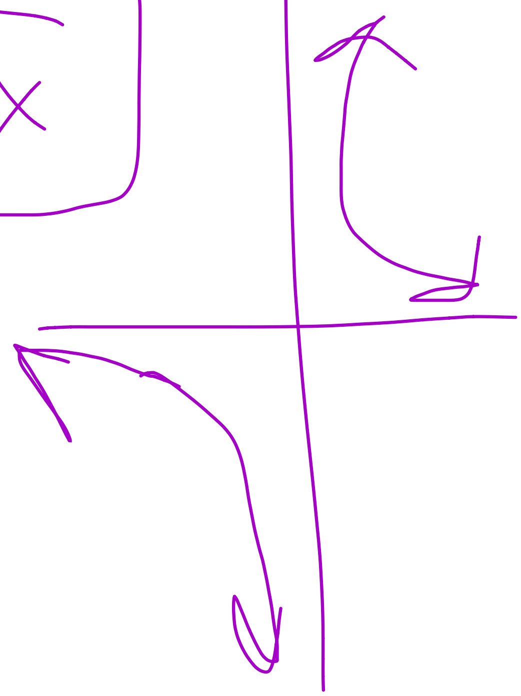
Rational / inverse

1. Let's take a look at this function! Create a table and graph of this function.

$\boxed{\frac{3}{x}}$ $\boxed{\frac{x}{3}}$

table in Desmos

x t time	y r rate
-2	-13,696.91
-1	-27,393.82
0	und
1	27,393.82
2	13,696.91



2. ~~Describe~~ the domain of the function. Explain.

$\boxed{(-\infty, 0) \cup (0, \infty)}$

horizontally never touch 0

Divide by 0

3. What is the range of the function? Explain.

$(-\infty, 0) \cup (0, \infty)$

vertically never touch

4. Describe the rate of change of the function. How does the rate of change of this function compare to the rate of change of other functions that we have encountered?

decreases at a decreasing rate

as x decreases y increases at a dereasing rate

5. In the model, the distance 27,393.82 is measured in km. What are logical units for *t* and *r*? Explain your thinking.

units

t = time = seconds

r = rate = km/sec

6. In the Watch Out for That Wave! task, we determined that the wave was traveling toward Family Kingdom Amusement Park at 224.66 m/s. Determine how long it will take the wave to reach the Family Kingdom Amusement Park. (Note that the units for the wave speed involve meters, not kilometers.) Explain your thinking.

km/s

D = 27,393.82 km
r = .22466
find the t

How many meters in a km
K H D B D C M
X1,000

$\frac{224.66 \text{ m}}{1,000}$

$\frac{1 \text{ m}}{.001 \text{ km}} \quad \frac{224.66 \text{ m}}{x}$

$x = .001(224.66)$

.22466

$\frac{27,393.82}{t} = r$

$\frac{27,393.82}{t} \times \frac{.22466}{1}$

.22466 km/sec

$\frac{121934.5478}{60 \cdot 60}$

$\boxed{33.87 \text{ hrs}}$

$\frac{27,393.82}{.22466} = \frac{.22466t}{.22466}$

Which representation of the function did you use to find the time it takes for the wave to reach the Amusement Park? Explain how you used this representation find your answer.

The equation
units km/sec
to find hrs

7. Why is this important information for the park? How could they use this to help them prepare?

figure out how long
before tsunami
hits

$\frac{27,393.82}{t} \times \frac{.22466}{1}$

$\frac{.22466t}{.22466} = \frac{27,393.82}{.22466}$

$t = \frac{121934.567 \text{ sec}}{60 \cdot 60}$

READY, SET, GO! Name ________________ Period ______ Date ________

$y = kx$ $y = \frac{k}{x}$

READY

Topic: Predict whether a relationship is direct or inverse variation.

For each of the following scenarios, as the first quantity increases, predict whether the second quantity increases or decreases.

1. number of people at the beach; ice cream sales direct

2. speed of a car; time it takes to travel 100 miles inverse

3. number of hours Thomas works each week; the amount of money he makes direct

4. number of people working on a project; time it takes to complete the project inverse

5. number of lottery jackpot winners; amount of money per winner inverse

SET

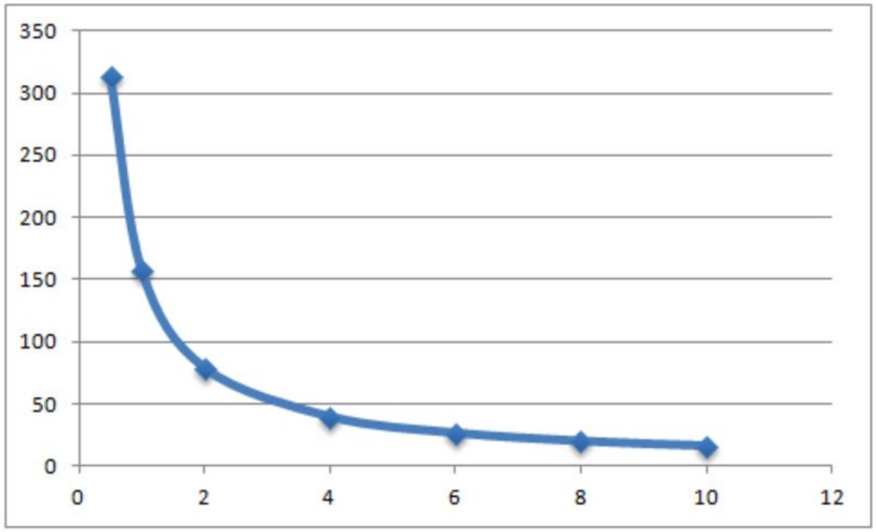
Topic: Inverse variation functions in context.

Boyle's Law states that as the pressure exerted on a gas increases, the volume of a gas decreases. A pump used to put air in a bicycle tire is a great example of Boyle's Law in action. When you push down on the pump, the volume inside the bike pump decreases, and the pressure of the air increases so that it's pushed into the tire.

If the volume inside of a bicycle pump is 8.2 cubic inches, and the pressure is 19.1 psi (pounds per square inch), the equation that represents this situation is:

$$V = \frac{156.62}{P}$$

A graph of this function is below.



6. What units are involved in this problem? Define the quantities and variables you would use to model this situation. Label them on the graph.

7. What type of function does this relationship represent? How can you tell?

8. If a pressure of 4 psi is exerted on the gas in the pump, what would be the volume of the gas?

$V = \frac{156.62}{4p}$ V=volume in in^3

p=pressure in psi

$\boxed{39.155\ in^3}$

GO!

Topic: Properties of exponents.

Simplify the following expressions.

9. $n^6 \cdot n^3$

10. $(x^5)^2$

11. $(3a^2b^{\frac{1}{3}})^3$

12. $\frac{x^8}{x^6}$

13. $\frac{x^5}{x^7}$

14. $\frac{x^4}{x^4}$

15. $(x^3y^6)^{-4}$

$x^{-12}y^{-24}$

$\frac{1}{x^{12}y^{24}}$

16. $8^{\frac{2}{3}}$

$\sqrt[3]{64}$

4

17. $x^{-\frac{1}{3}}$