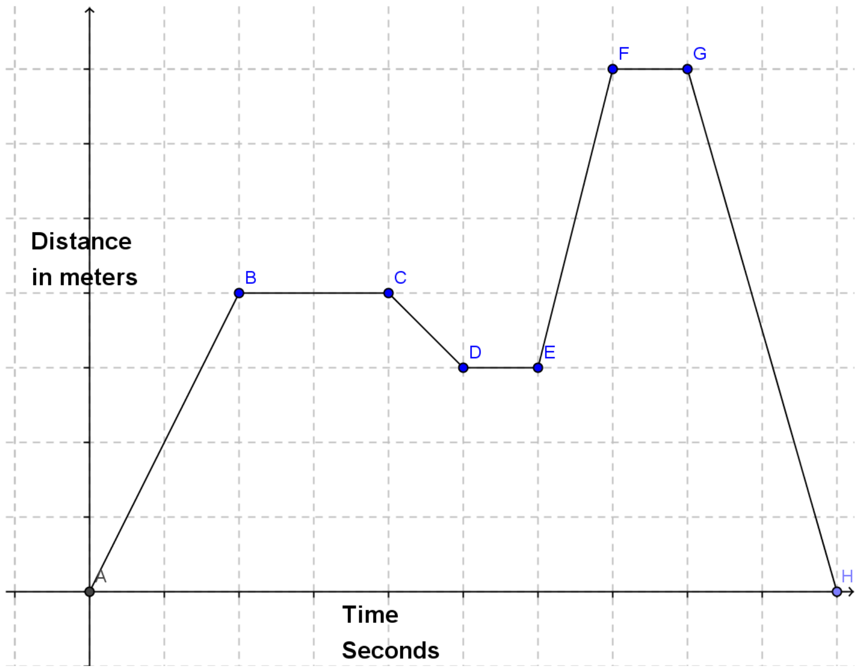
Functions 7 – Graphing in Context
7.1 – Warmup: Skateboard Ride

Name ______________________________
Per _______ Date __________________

1. Cierra goes for a ride on her skateboard on her straight and level street. She starts from her home, which is located at the end of her street, and travels up and back. Below is a graph of her distance from home versus time, where t = 0 corresponds to the time she began her ride.



a. What was Cierra doing between times B and C? Explain.

b. During which times was Cierra traveling away from her house? Explain.

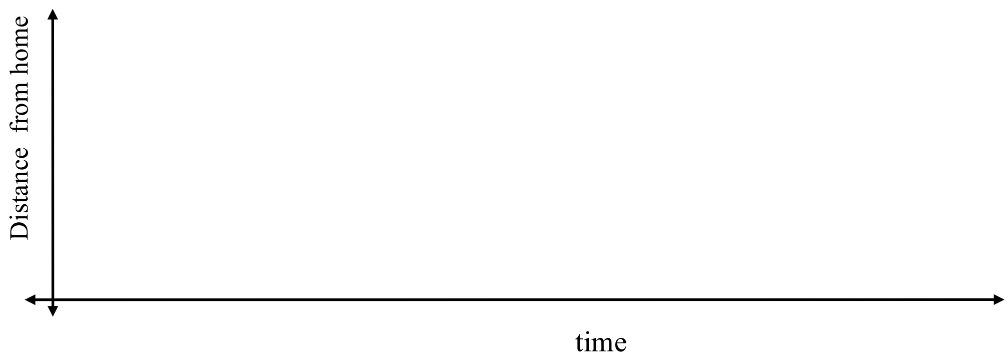
c. During which times was Cierra going the fastest on her skateboard? Explain.

d. What was Cierra doing between points G and H? (H is the point to the farthest right on the graph.) Explain.

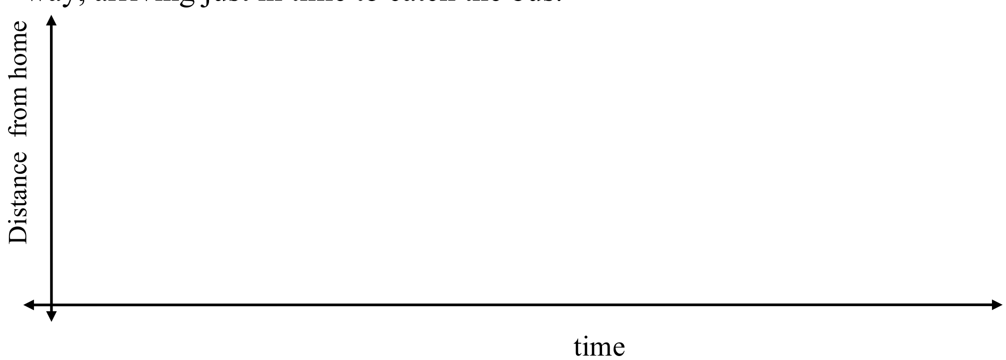
Functions 7 – Graphing in Context　　　　　Name ______________________________
7.2 – Problem Set: Keoni Walking　　　　　Per _______ Date __________________

Keoni takes the bus to school and he must walk and/or run to the bus stop in order to catch the bus. The bus stop is located about 1 mile from his home, on the same street. Assuming $d(t)$ represents the distance from Keoni to his home at time t, where $t = 0$ represents the time he left home, graph approximate functions of d versus t for each storyline below from the time he leaves his house to the time he boards the bus. Note: you do not need to consider the scales.

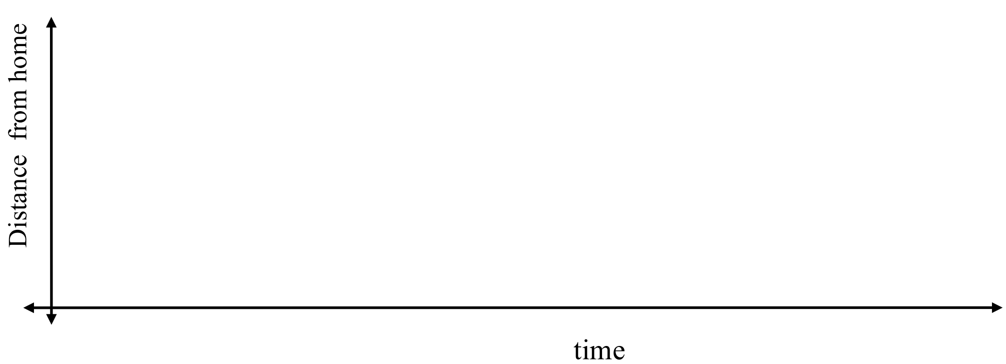
1. Keoni walks at a constant rate and arrives 10 minutes before the bus arrives.



2. Keoni is late. He runs as fast as he can until he gets tired, and then walks the rest of the way, arriving just in time to catch the bus.



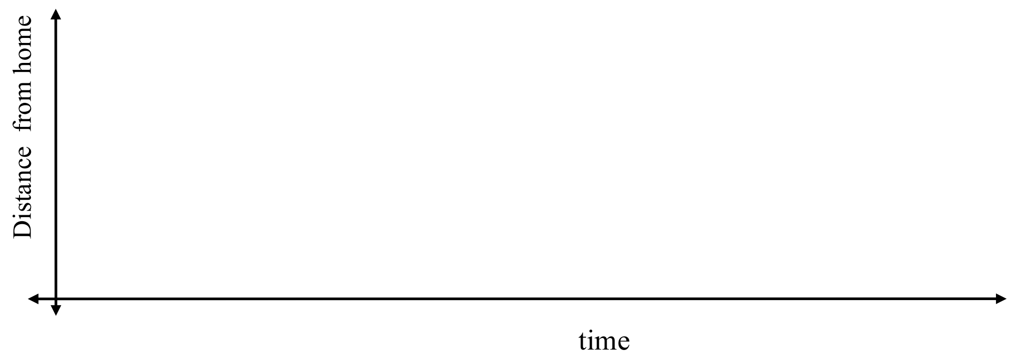
3. Keoni walks at a constant rate until he runs into one of his old acquaintances, one with whom he used to get into trouble with all the time. This acquaintance is skipping school today and is trying to convince Keoni to join him. Keoni talks with her for about 5 minutes, realizes he will miss the bus if he doesn't leave right away and runs the rest of the way at a constant rate, arriving just in time to be the last one on the bus.



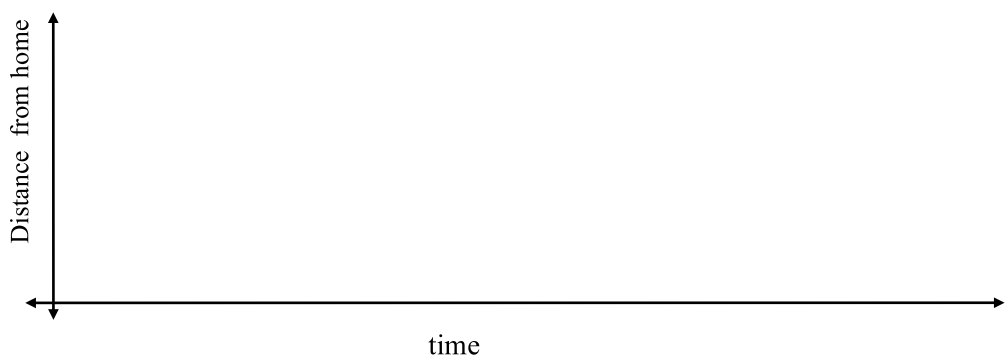
Functions 7 – Graphing in Context
Name ______________________________

7.2 – Problem Set: Keoni Walking
Per _______ Date __________________

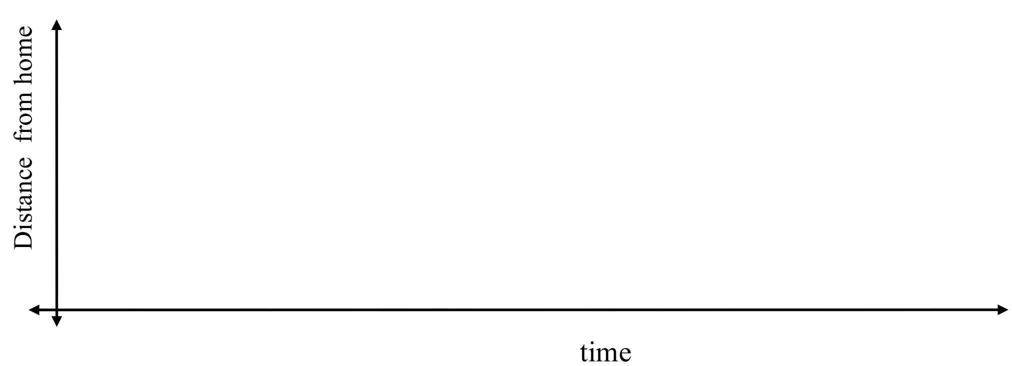
4. This time Keoni is really late! He runs as fast as he can all the way to the bus stop, but runs slower and slower as he gets tired…after all it is a whole mile. But, he appears to have missed the bus. He waits and waits (about 20 minutes) and then remembers it is Prince Kuhio Day…a holiday!! He runs as fast as he can home…exactly the same as on the way to the bus stop…fast at first and tiring when he approaches his destination…just in time to catch the end of the morning cartoons.



5. Keoni is early today, so he walks at a leisurely rate. About a quarter of the way to school he realizes he forgot his math homework, again! He walks briskly back home, but about halfway back home he remembers he didn't have math homework, so he walks even faster to the bus stop, arriving about 1 minute before the bus arrives.

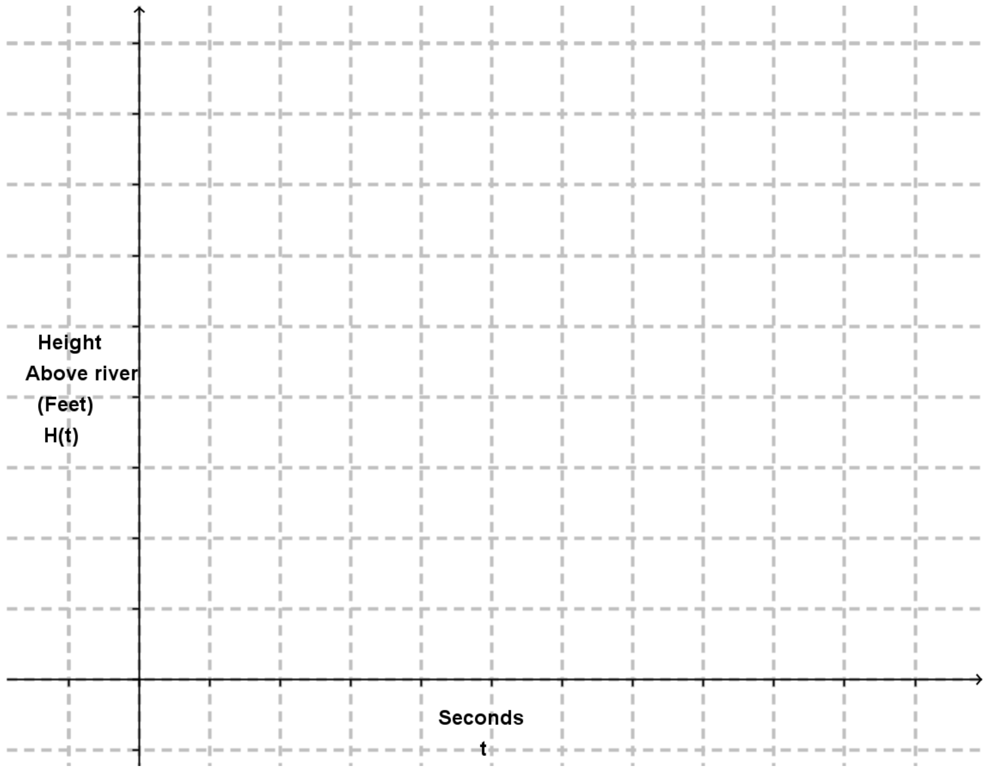


6. Keoni has plenty of time to get to the bus. He walks slowly for awhile, and then stops to watch a gecko chase a bug. He continues at a slightly faster pace for awhile longer and stops again, this time to tie his shoe and watch a man unload tools from his truck. He realizes he's possibly late now and continues at a still faster pace until he arrives just in time to catch the bus.



Name ______________________________
Per _______ Date __________________

1. Keahi stands on a bridge high above a river. He leans over and throws a rock as hard as he can straight up into the air in an effort to hit a bird flying by (Keahi seems to need a lesson in proper behavior). He then recognizes the bird to be a rare Hawaiian Owl and he is relieved that he missed hitting the Owl. The rock drops straight back down and falls into the river below. Let $H(t)$ represent the height above the river t seconds after releasing the rock.
   a. Graph H versus t below.

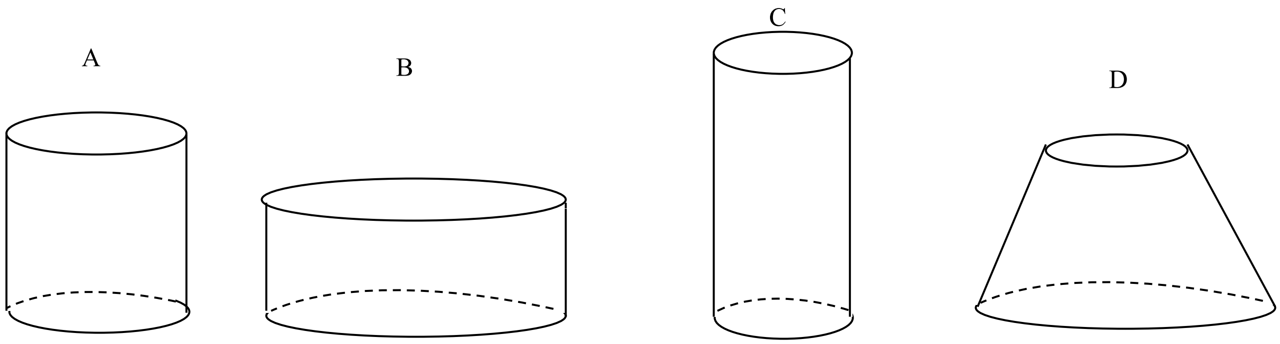


   b. What does the y–intercept represent in context? Explain.

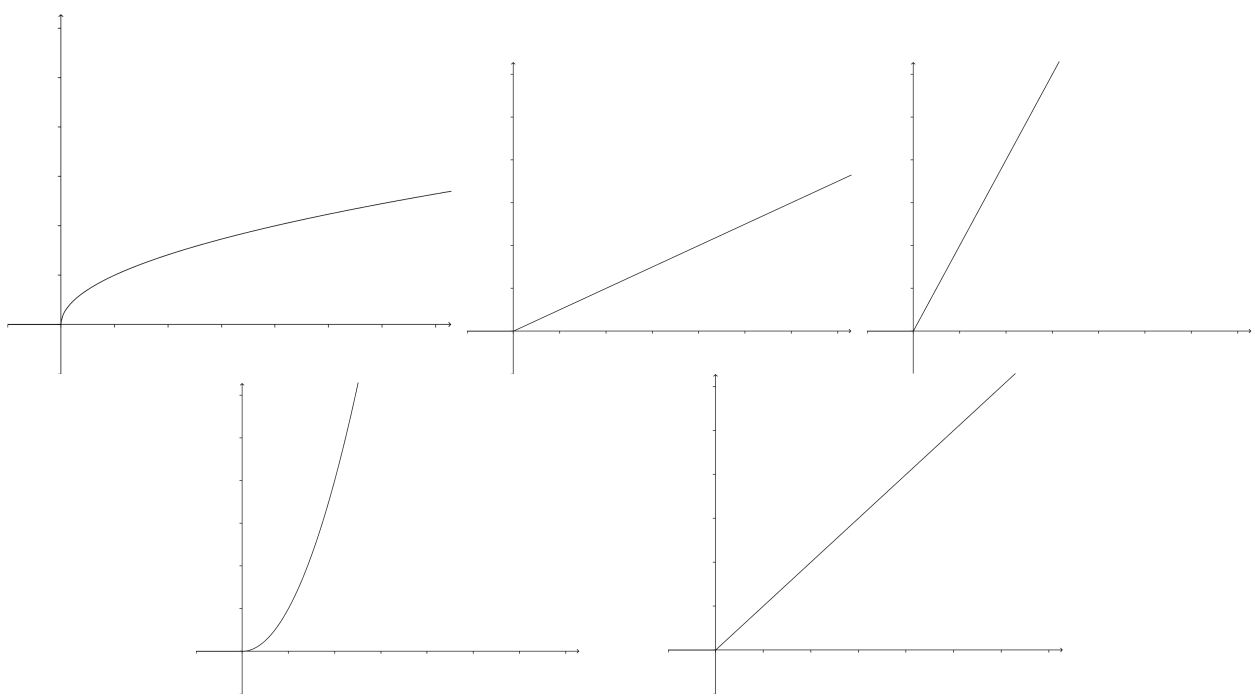
   c. What does the x–intercept represent in context? Explain.

Functions 7 – Graphing in Context Name ______________________________
7.4 – Warmup: Water Into a Container Per _______ Date _________________

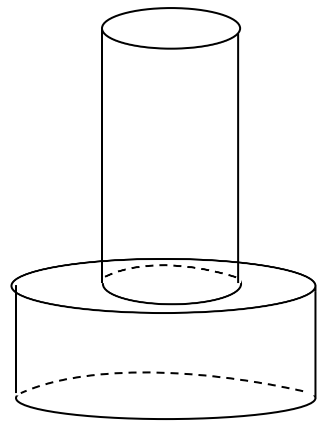
Water is poured into the following containers at a constant rate.

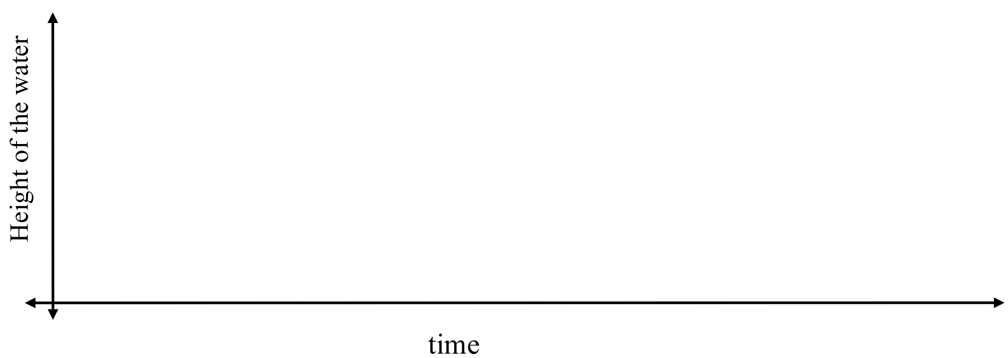


Match the graphs below, which represent the height of the water at time t, with the containers above. Assume t = 0 corresponds to the time when the water began entering each of the containers, the scales on all graphs are the same, and that the rate at which the water entered the containers was the same. Explain why you chose each one and why the other graphs do not work for each container.

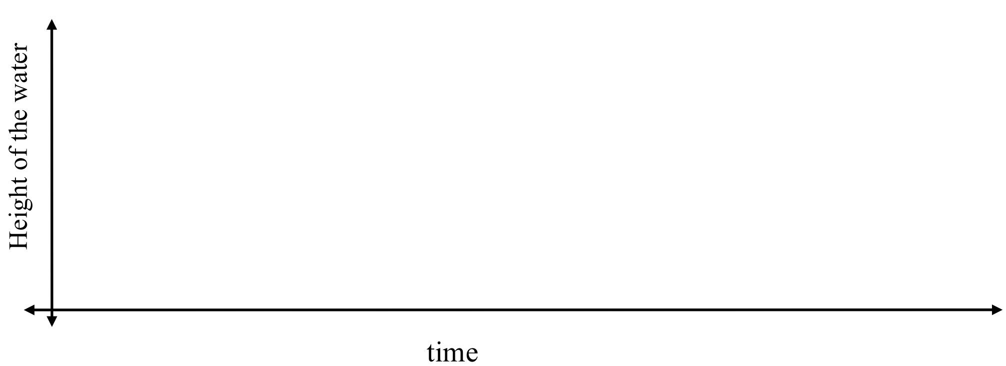


1. Paco's dad asks him to fill up the container below with water. The container includes both the larger cylindrical base and the smaller cylindrical top portion. He turns on the water faucet and goes off to play video games. Graph an approximate function of height versus time, from the time water enters the container until it fills up. Note: you do not need to consider the scales for either time or height.

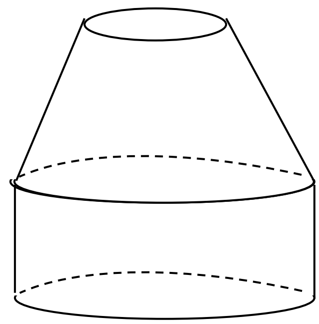


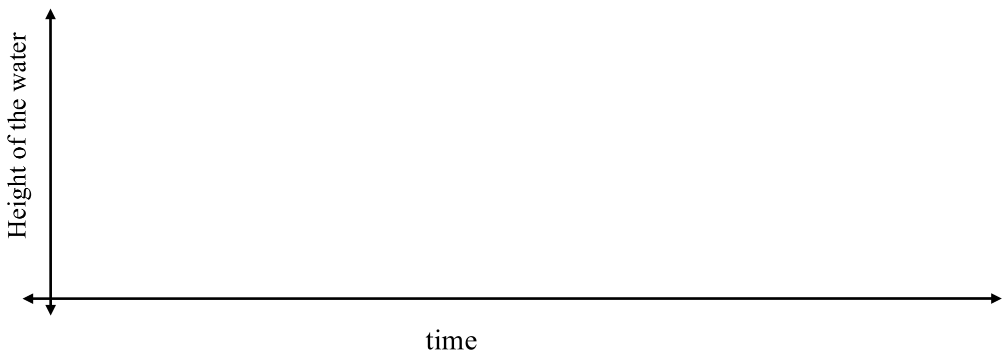


2. Now suppose Paco's sister comes along and pours the water out so that Paco must fill it up again, hopefully before his dad gets impatient. He turns it on again at the same rate as before and goes off to finish his video game. He comes back to find that the bottom cylinder is only half full. He turns the water pressure up twice as much as before and waits patiently for the container to fill up again. Graph an approximate function of height versus time, again from the time water enters the container until it fills up.

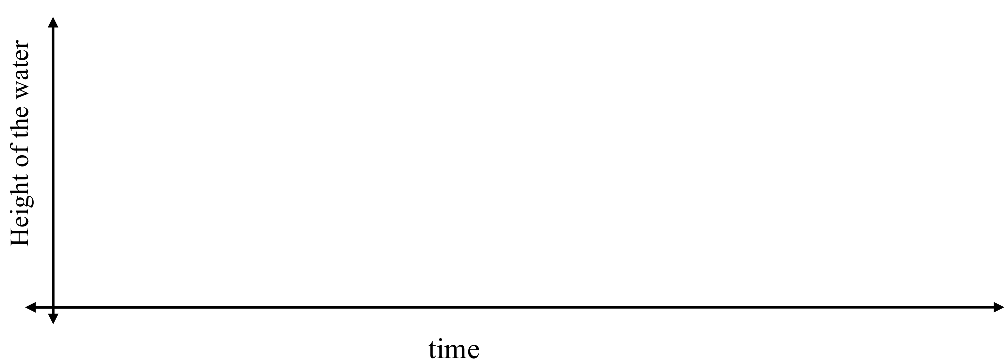


3. Paco's dad asks him to fill up another container with water. This container, shown below, includes both a large cylindrical base and a smaller non-cylindrical top portion. He again turns on the water faucet and goes off to play video games, but this time he makes sure his sister is helping his mom. Graph an approximate function of height versus time, from the time water enters the container until it fills up.

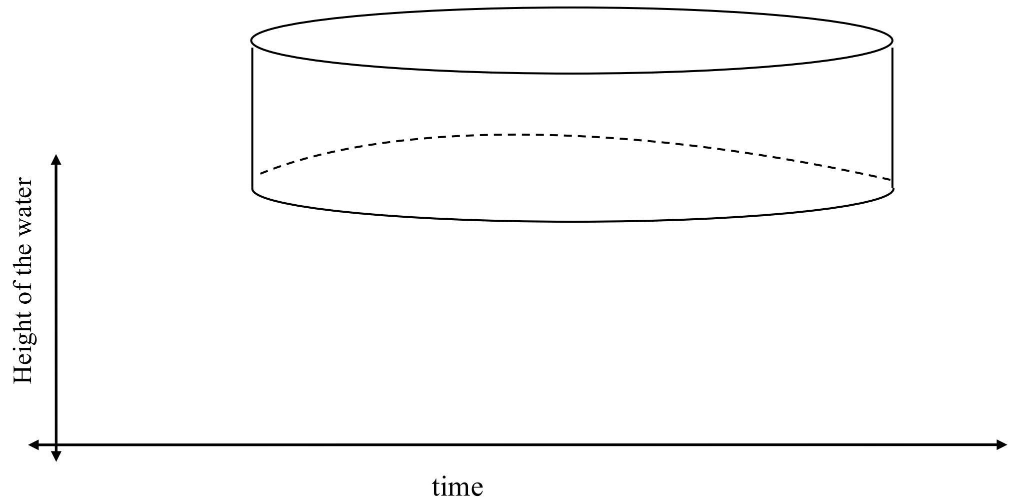




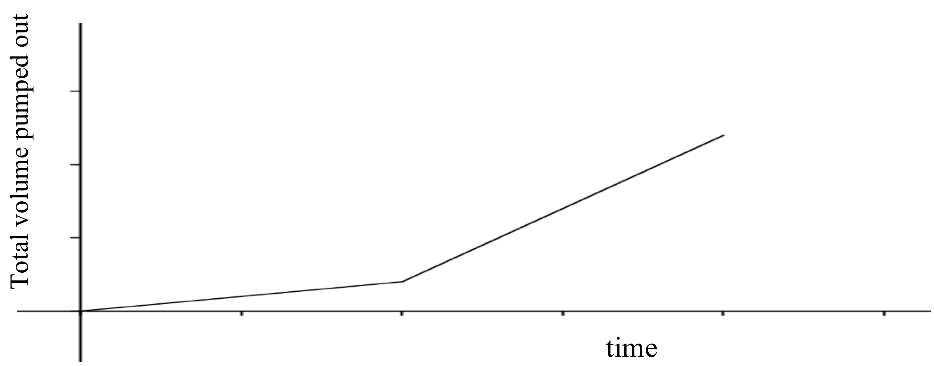
4. Paco comes back just in time to turn the water off as the water reaches the top. He takes it to his dad, who promptly pours it on his new hibiscus plants and then asks Paco to go back and fill it once more. Paco is getting bored with this, but what can he do? He dutifully turns the water on, full blast this time, and once more waits for the container to fill up. It fills up pretty fast, but right when the cylindrical portion fills up the hose gets a leak, one that seems to get worse and worse as time goes on, but the container finally fills to the top. Graph an approximate function of height versus time, again from the time water enters the container until it fills up.

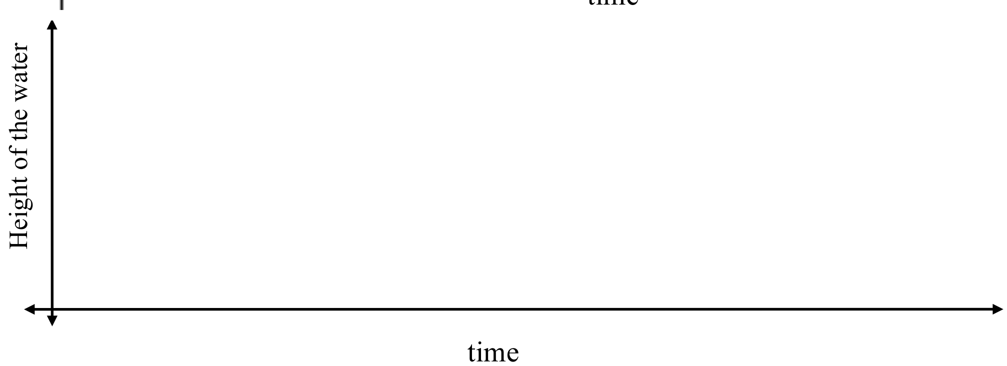


5. Paco and his little brother and sister are getting a small wading pool. Dad turns on the hose and begins to fill it up. It fills very slowly and after an hour Paco and his siblings get impatient, they want to go swimming, or at least wading. Paco's little brother and sister get a couple of buckets and run next door to fill them up. Every five minutes they come back and dump them both into the pool. Paco thinks they're silly and goes back to his video game. Graph the height of the water in the pool from the time Dad turned on the water until it fills up, which takes about 3 hours.



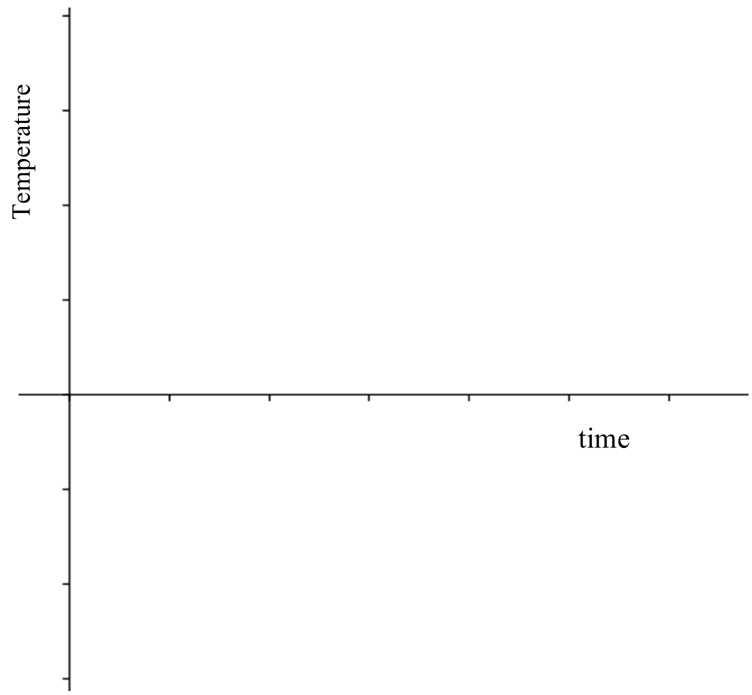
6. Paco's dad decided to buy the kids a real pool, so he must pump the water out of the wading pool. He bought a cheap pump, that went kind of slow, but then the neighbor gave him a good pump, which quickened the process. Below is the graph of the total amount of water (volume) pumped out of the pool after t minutes, versus time. Graph the height of the water $h(t)$ in the pool versus time as the pool is pumped out.



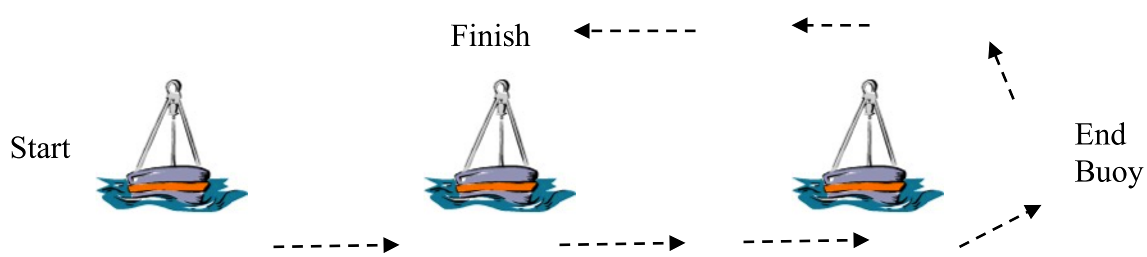


Name ______________________________
Per _______ Date ___________________

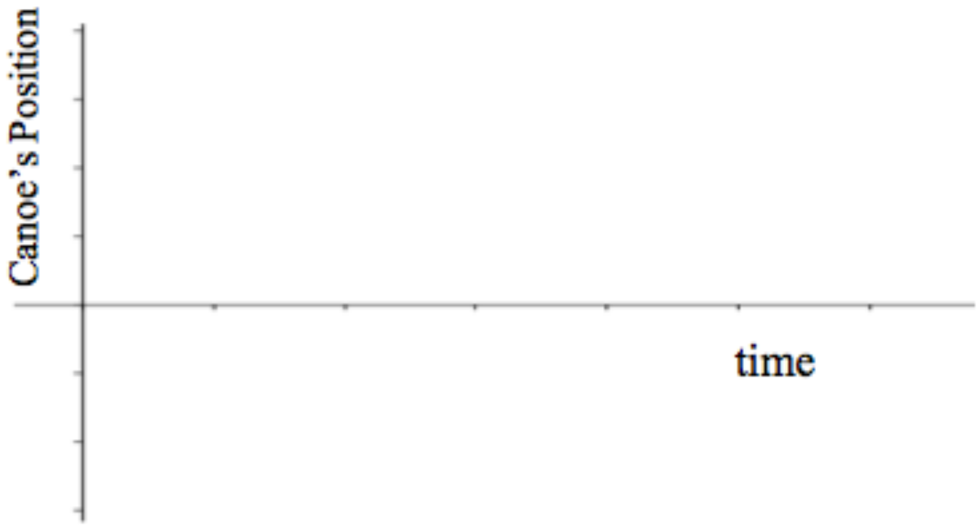
1. Maria loves pizza and math, which is not uncommon (most people love pizza). She took frozen pizza out of the freezer, put it into the microwave for 2 minutes, and then put it on the counter to cool. While she was waiting for it to cool, she tried to visualize the graph of temperature of the pizza, in degrees Fahrenheit, from the time she took it out of the freezer until it was cool enough to eat. Graph below what she should have seen in her head. (You do not need to provide specific values.)



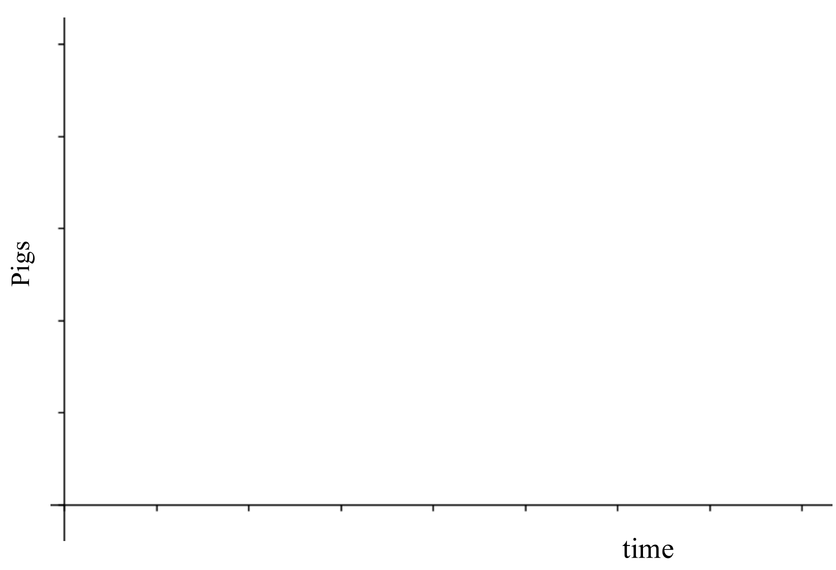
2. Kainoa is in a canoe race. The starting line is located at the Starting Buoy, directly west of the Center Buoy, which also serves as the finish line. His team must pass the Center Buoy, where the judges are located, proceed to the End Buoy, which is located directly east of the Center Buoy, travel around the End Buoy and return to the finish line at the Center Buoy.



Graph the position of Kainoa’s canoe relative to the Finish line, where positions west of the Center Buoy are represented as negative (distances) and positions east of the Center Buoy are represented as positive distances.

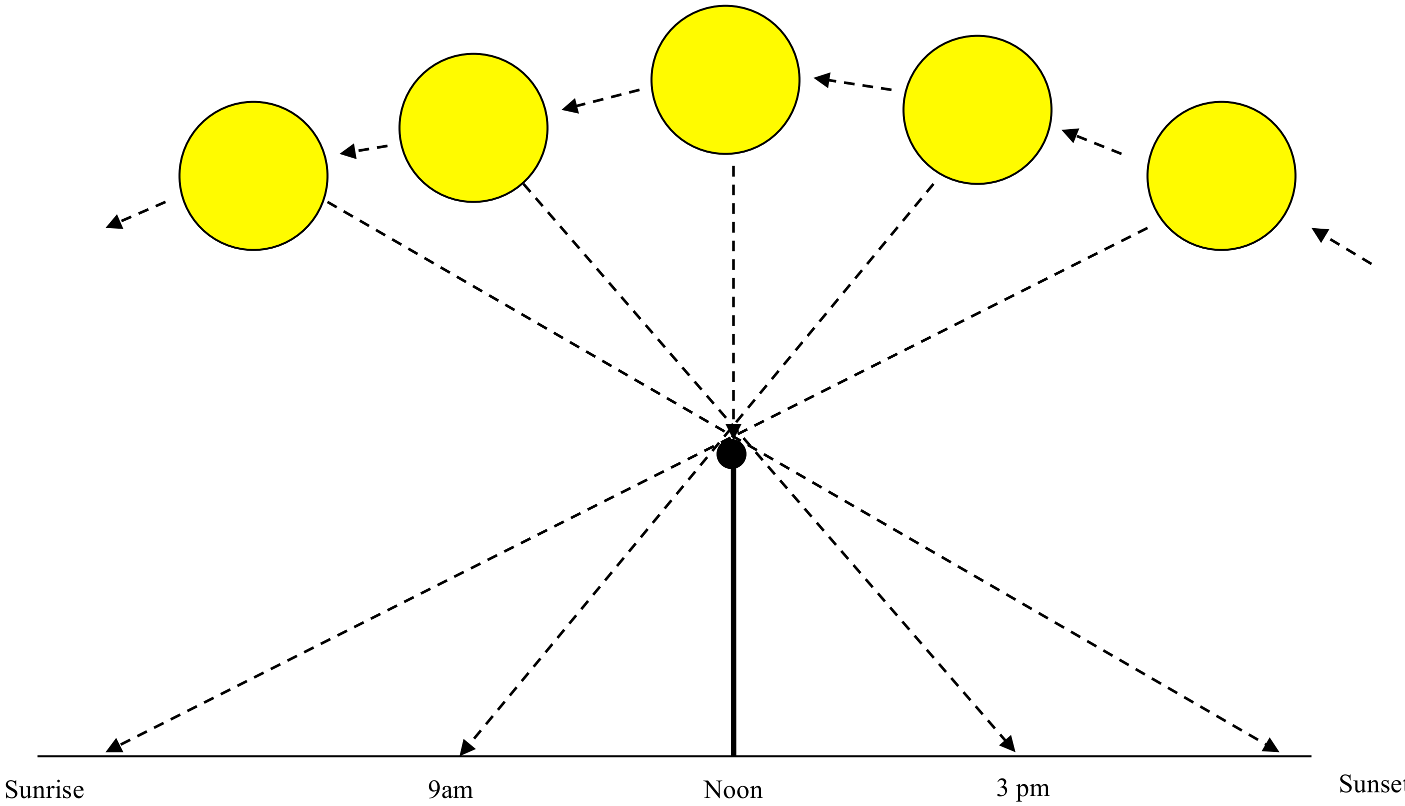


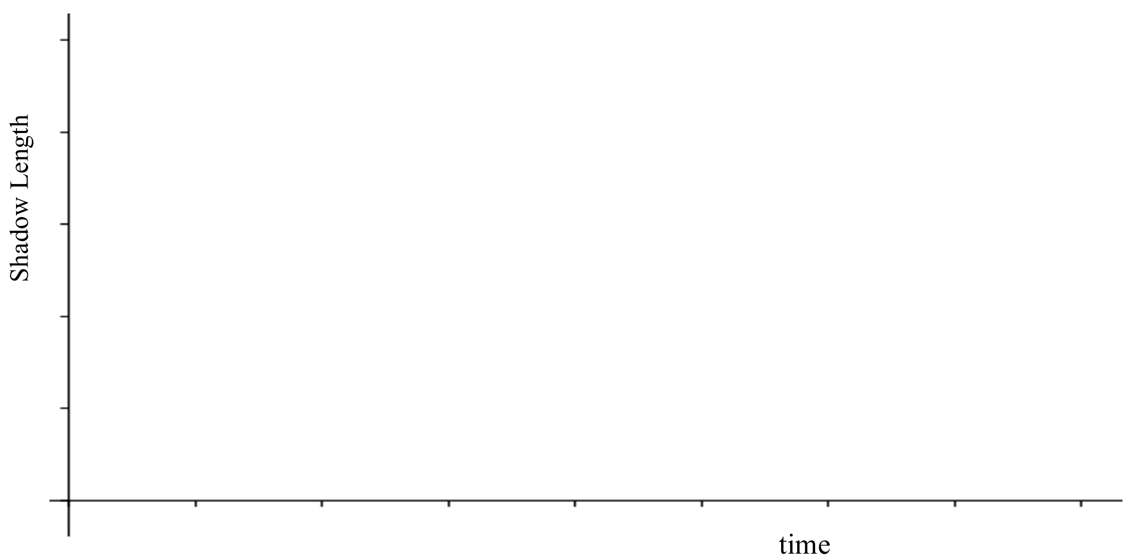
3. Your Civic Club has volunteered to join an effort to eliminate feral pigs from the national park. Since the pig population is out of hand (it’s wreaking havoc with the delicate ecosystem in the park), it’s easy to find and capture the pigs when you begin, but as time goes on it gets more and more difficult as the populations is depleted. On the positive side, this means your efforts have been successful, but on the negative side it’s getting harder and harder to capture the pigs. Assume your club goes out every Saturday to hunt the pigs. Draw an approximate graph of the total number of pigs captured versus time, beginning when your club joined the effort. On the same axes, graph the total pig population in the park. Be sure to label each of your graphs.



Name ______________________________
Per _______ Date ___________________

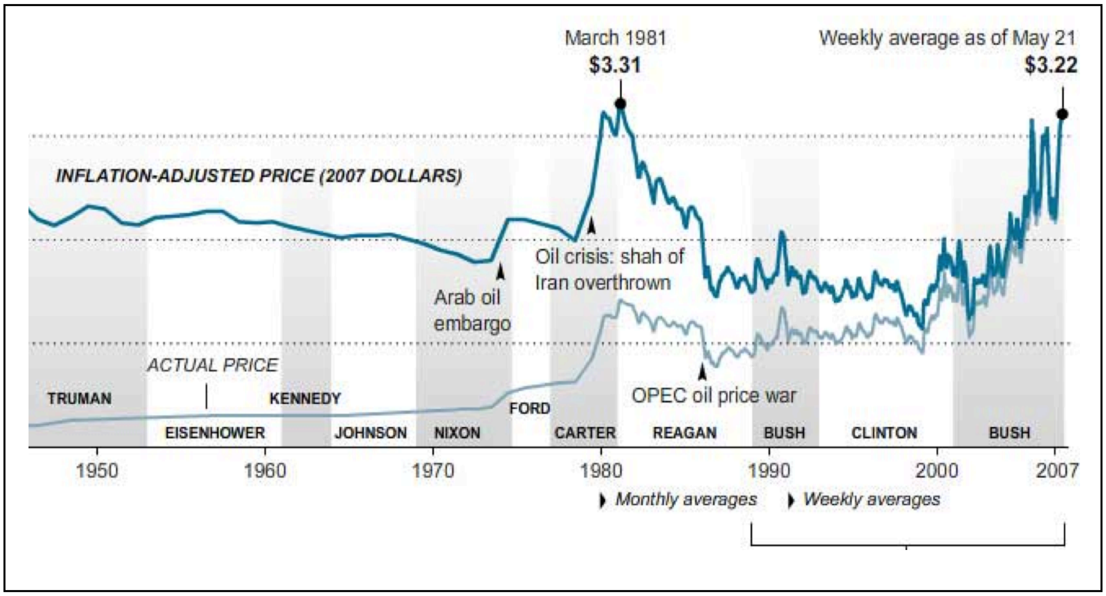
Jenna lives in Quito, Ecuador, right on the equator. She wants to make a homemade sundial by placing a pole into the ground and marking on the ground the shadows the sun makes with the pole at various times throughout the day. (See the sketch below.) Graph L(t), the length of the shadow cast by the pole at time t hours after sunrise, from sunrise to sunset. Note: Since Quito, Ecuador lies precisely on the equator, you can assume the sun rises at 6am each morning and sets at 6pm every evening. (Keep these results for the exit pass/homework at the end of this section.)





Name ______________________________
Per _______ Date _________________

1. Below is a graph that depicts both the actual average price of gasoline in California and the average price adjusted to 2007 dollars from 1950 to 2007. Note: each horizontal line depicts an additional $1 cost.



a. Place the following years in order, from lowest to highest, in terms of the actual price California consumers were paying for gasoline.

1950 1975 1982 1987 1999 2005

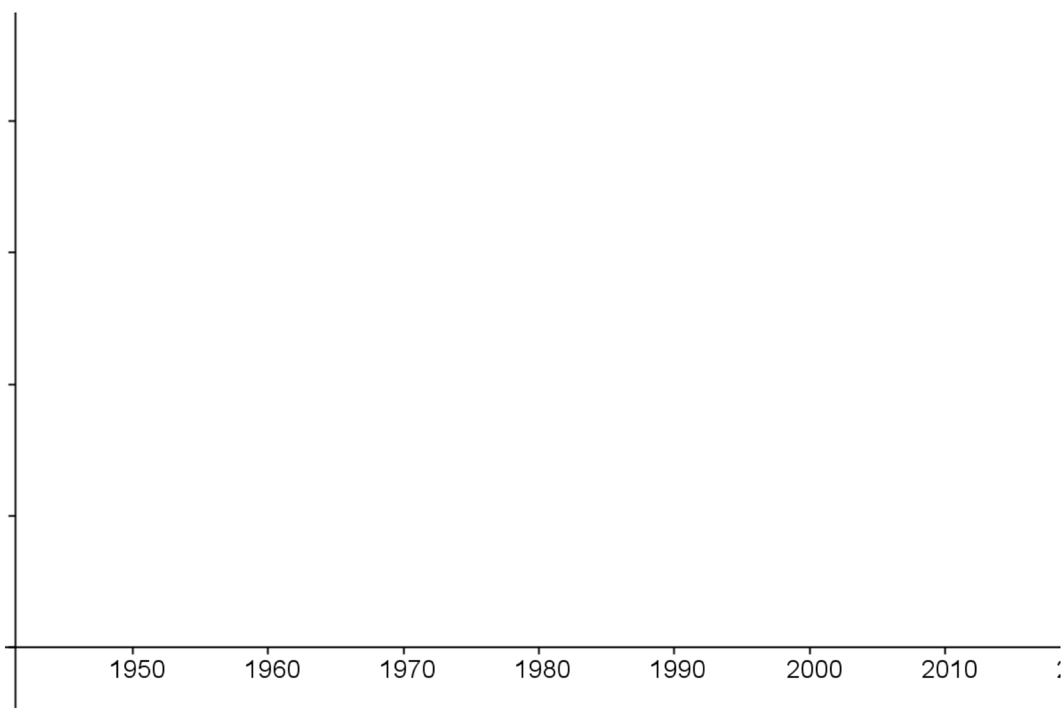
b. Place the following years in order, from lowest to highest, in terms of the price California consumers were paying for gasoline adjusted to 2007 dollars.

1950 1975 1982 1987 1999 2005

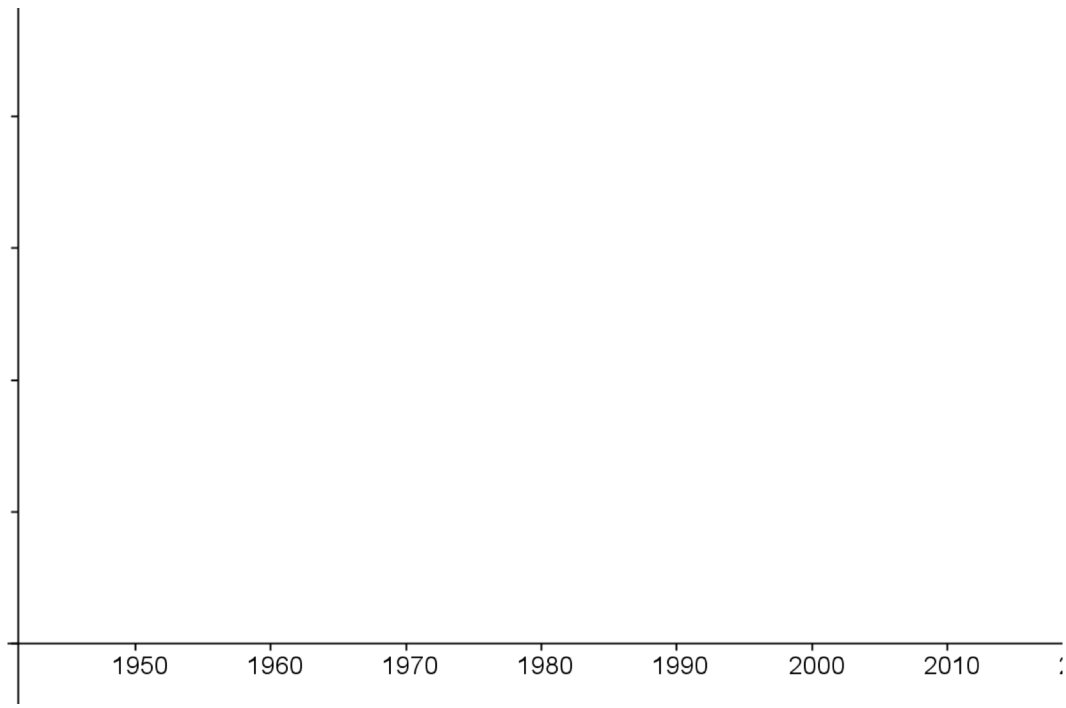
c. In 1973 the major oil suppliers attempted to increase the price of oil by simulating a shortage through what was referred to as the Arab oil embargo. Essentially they used the classic Supply/Demand Economics model to attempt to force an increase in the price of oil by limiting its supply. As a result, the supply shortage was so severe that consumers in California were only allowed to buy gasoline every other day according to whether their license plates ended in an even or odd number. People would wait for hours in long lines just to fill up their cars. Describe the trend in gas prices prior to the embargo, and describe whether or not the embargo was a success for the oil producers.

d. What international event caused the steepest increase in oil prices? Why do you think this event caused such a severe increase?

e. Gas prices affect peoples' driving habits. In particular, when gasoline prices increase too quickly families tend to vacation closer to home or forego vacations altogether, while families tend to ignore slowly increasing prices. Graph below the average annual miles driven for a typical California family from 1950 to 2007. Note: since the driving habits are different for every family we're only interested in whether or not the miles driven increased or decreased over time. Be sure to label the *y*-axis, but you can ignore the scale.

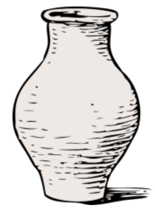


f. Finally, combine the information from the two graphs to graph below the approximate average annual expenses on gasoline for a California family from 1950 – 2007, adjusted to 2007 dollars. Be sure to label the *y*-axis. Try to include a reasonable scale for the y-axis. Hint: consider what you think your own family spends on gasoline each year.

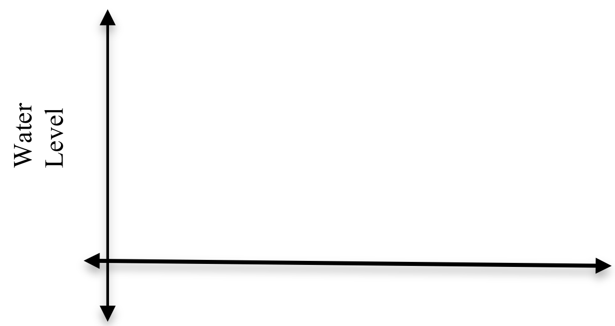


Name ______________________________
Per _______ Date ___________________

1. Imagine you are filling up the below vase from a source of water coming out a constant rate.



Graph the height of the water level as a function of time below.



2. You are filling up a vase from a source of water coming out a constant rate. Below is the graph of the height of the water as a function of time. Draw the vase that accompanies this graph.