1) The graph to the right shows the deer population *t* years after 100 deer were introduced to a state forest.

a) Find the average rate at which the population changed over the first 25 years. Include a label, and show how the rate can be seen on the graph.

$\frac{\Delta y}{\Delta x} = \frac{f(25) - f(0)}{25 - 0}$

$= \frac{800 - 100}{25}$

$= \frac{700}{25}$ ← think like 25¢ AND $7

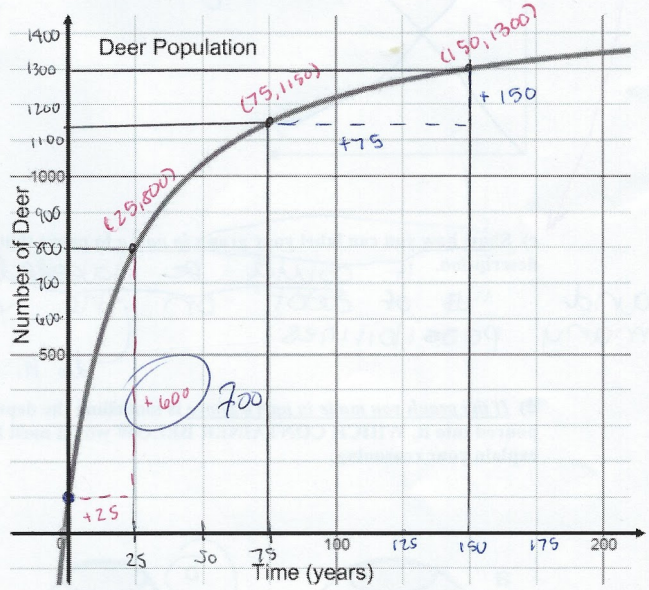
$= 28$ deer/yr

nice

For the first 25 yrs, the deer population grew by about 28 deer each year.

good

* draw arrows



b) Find the average rate at which the population changed from 75 to 150 years. Include a label, and show how the rate can be seen on the graph.

$\frac{\Delta y}{\Delta x} = \frac{f(150) - f(75)}{150 - 75}$

$= \frac{1300 - 1150}{75}$

$= \frac{150 \text{ deer}}{75 \text{ yrs}} = 2$ deer/yr

yup

From 75 to 150 yrs, the deer pop. grew by about an avg. of 2 deer each year.

increasing at a decreasing rate → comprehension issue

2) Using your answers in exercise 1, write a description of the function. Start with an "is a function of" statement, and then elaborate. Be specific.

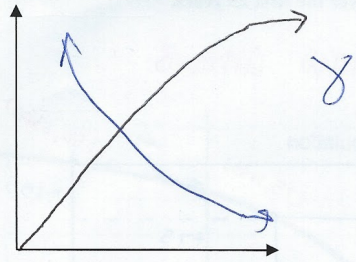
- The deer population is a function of time.
- As time passes, the population increases at ~~an~~ a ~~increasing~~ decreasing rate.
- At first this ~~rate of change~~ population increases at a faster rate. For ex, the pop. increased by about 28 deer each yr for the first 25 yrs. (incorrect)
- As time goes on, though, the rate of change decreases (correct) and the increase in pop. slows down. From 75 to 150 yrs, the pop. only increases by about 2 deer each year, which is significantly smaller than the previous example

Conflicting statements. 1st: rapid increase in pop. Then: slower increase in pop.

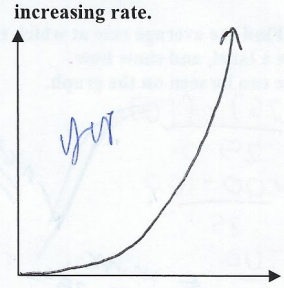
Comprehension error/communication error

3) Sketch a graph that matches each description below.

a) f(x) is decreasing at a decreasing rate.



b) g(x) is increasing at an increasing rate.

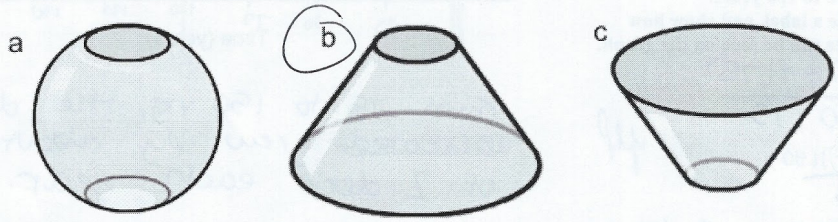


c) Show how you can label your graph *in part a* to prove that your graph correctly matches its description. It could be labeled "time" on the x-axis, and "$ of debt" on the y-axis. This is one of the many possibilities.

do it...

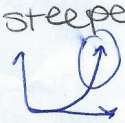
Δx Δy

d) *If the graph you made in part b above* is modelling the depth of water in a container as water is poured into it, WHICH CONTAINER BELOW would most likely be the one being filled? Briefly explain your reasoning.



Graph B most likely corresponds w/ container B because the bottom is wider, which relates to a less steep, slower rate of change on the graph.

The container gets thinner closer to the top, which explains why the graph gets steeper, annotating a faster rate of change.



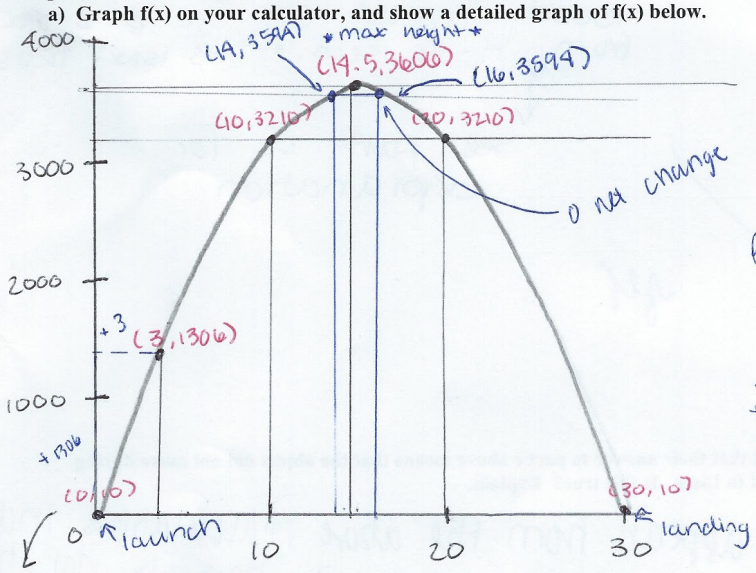
• This all has to do w/ fill time. Water fills smaller areas quicker and wider areas slower.

excellent

f = height of rocket x = time after launch (s)

4) $f(x) = -16x^2 + 480x + 10$ **describes the height (in feet) of a rocket launched vertically off of a platform x seconds after it is launched.**

a) Graph f(x) on your calculator, and show a detailed graph of f(x) below.



The height starts at 10ft because that is the height of the rocket.

* The rocket kept climbing higher until it started falling back to Earth, which occured around 15 secs. Then it started losing altitude, which is why the rates of change after 15 are neg.
* this is called a sub-orbital rocket launch *

excellent

* one can infer from the graph that this rocket is a small model, testing rocket because it only goes up 5,000ft. It doesn't have the right mass/speed ratio to carry it into space. That's why it falls back to Earth in a sub-orbital launch. *

b Determine the average rate of change over the first three seconds. Show all work. (Use your graph to support your results.) What does your answer mean in context?

$$\frac{\Delta y}{\Delta x} = \frac{f(3) - f(0)}{3 - 0}$$

$$= \frac{1306 - 10}{3}$$

$$= \frac{1296}{3}$$

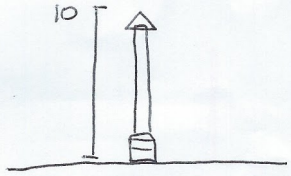
$$1296 \div 3 = 432$$

$$= 432 \text{ ft./s}$$

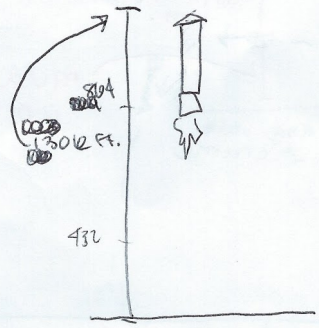
good

For the 1st 3 sec, the rocket was travelling app. 432 feet each s.

at launch:



after 3 sec



* some about the scaling of the rocket is *

c) Determine the average rate of change from 14 to 16 seconds. What does your answer mean in context?

$$\frac{\Delta y}{\Delta x} = \frac{f(16) - f(14)}{16-14}$$

$$= \frac{3594 - 3594}{2}$$

$$= \frac{0}{2}$$

$$= 0 \text{ ft./s}$$

* According to the calculations, the rocket travelled 0 ft. in 2 seconds from 14 - 16 secs. * THIS ISN'T TRUE *

↓ see part d for explanation

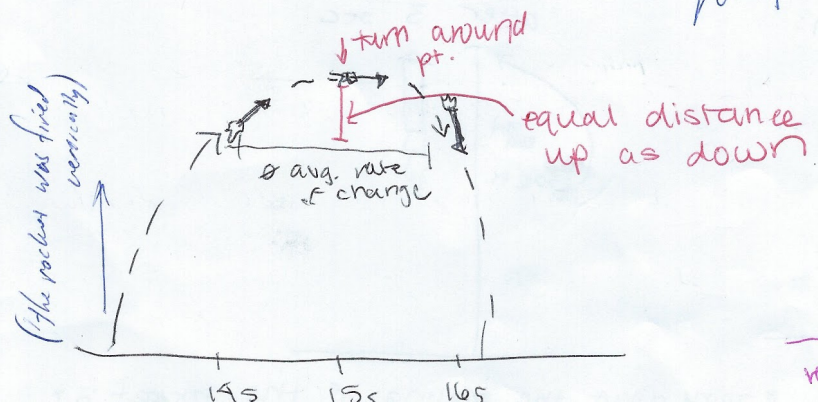
yes

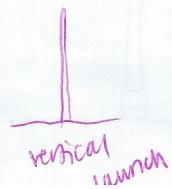
d) A student suggested that their answer to part c above means that the object did not move during the two seconds from 14 to 16sec. Is this true? Explain.

While it appears from the above calculations that the rocket didn't move at all (from 14 - 16 s), this is not true and goes against the laws of physics. How can something w/ so much energy just stop in mid-air and float? What actually happened was the rocket travelled a certain distance upwards, turned around, and travelled the same distance downwards. (it reached its apex). This is why the net rate of change appears to be 0 ft/s.

* unless you're in space, but it starts at 65 m and the rocket only goes 3 feet ft. Not even a mile.

good





Name: Emerson Dycus

Item or topic	Accurate and justified	Needs to Improve	Simple Mistake	No Evidence or Fail to Justify	Communication Issues Notation Issues	Method Issues	Comprehension Issues	Didn't do
1a	X							
1b	X							
2		X			X		X	
3a		X					X	
3b	X							
3c					X			
3d	X							
4a	X							
4b	X							
4c	X							
4d	X							

What specific steps will be taken to improve future work:

From this chart one can see that while most of my work was accurate and justified, a few problems faced communication/comprehension errors. This was mainly with the increasing/decreasing rate statements and understanding how the shape of graphs translates into these statements. This is something that can improve with practice, and it is a very specific problem. Most of the test demonstrated that I met my previous goal of practicing the topic a bunch in homework so I felt comfortable with it/was able to give efficient and thorough answers when it came to the test. I guess for next time I will just have to make sure I comprehend the different shapes of graphs and what they mean, which again can be improved with practice.

What did you do well? What should you continue to do to ensure repeated success?

As I stated above, the thing I did well with when preparing for my test was practice. This is definitely evident in my homework file. Also, I did quality work, not slacking because "it's just homework" or "Mr. Guyette doesn't always check it when we get to class". This is something I really appreciate about this year's homework grading policy: it's not an everyday on going average, and you don't tally up the number you got wrong everyday. To me, homework this year doesn't seem like "homework", where you have to stress out if you got it wrong or not or what a bad grade you'll get. It's practice, and practice only

gets better by learning from mistakes. I've learned not to be afraid to make mistakes because that's how I've come to fully comprehend the topics. As long as you give effort to understand the topics, you'll succeed, and your "grade" will too. Of course, I'm far from perfect when it comes to math, and I made some mistakes on my test. But as I just said, I'll be sure to learn from these mistakes and use them to deepen my understanding of the topic at hand.

Student perception of score on a 1-21 scale: 17-19 (if any additional evidence of this grade is needed, please see my answers to number 4, or my homework file. I feel that both of these show my level of work ethic, and how I understand the topic of avg. rate of change)

Criteria for Grading Tests and converting scores to NDA grades.

- **Test Score 19-21 NDA Grade A+**
  - **All the qualities of excellence are demonstrated throughout the test**
  - **Student goes beyond the normal expectations to communicate a unique method**
  - **Difficult problems are solved correctly and justified clearly and logically**

- **Test Score 16-18 NDA Grade A**
  - **Excellent work. Achieving the standard for all major topics assessed**
  - **All or mostly all work is clear, concise, and fully supported**
  - **Efficient and elegant mathematical methods are applied when appropriate**
  - **Clear evidence of deep levels of comprehension exists throughout**
  - **Notation is flawless.**

- **Test Score 13-15 NDA Grade A-**
  - **Very good work. Achieving the standard for almost all of the major topics assessed**
  - **Most work is clear and supported, some work or support is incomplete or incorrect**
  - **Efficient and elegant mathematical methods are applied through much of the paper**
  - **Routine and traditional-style math problems are correct.**
  - **Evidence of comprehension exists**
  - **Notation is relatively flawless**
- **Test Score 10-12 NDA Grade B**
  - **Good work. Achieving the standard for the majority of major topics**
  - **Some work is clear and well supported, but in several cases limited or no support is provided**
  - **Efficient mathematical methods are applied through some of the paper**
  - **Routine and traditional-style math problems are mostly correct.**
  - **Some evidence of comprehension exists, but in some cases results were incorrect and the error went unnoticed (revealing potential lack of understanding)**
  - **Notation is good in some cases, but in some cases misapplied notation becomes a distraction**

- **Test Score 7-9 NDA Grade C**
  - **Minimally achieving the standard/"In the ballpark" on some topics.**
  - **Work is often unsupported**
  - **Some mathematical methods applied, but it is clear that some of the methods being assessed were not learned or mastered at this point**
  - **reasonable evidence of understanding in some places, gaps in comprehension exist, many errors went unnoticed**
  - **Communication is clear in some places, incomplete in others**
- **Test Score 4-6 NDA Grade D**
  - **Routine/basic problems are not done correctly**
  - **Major gaps in logic and/or comprehension are clearly evident**

- **Communication is lacking**
- **Notation errors minimal/no attempt to apply conventions to written work**

- **Test Score 1-3 NDA Grade F**
  - **Forget to do it. Leave blank. Don't try.**