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2023

### Analyzing Real Life Scenarios through Linear and Exponential Functions using Open Pedagogy.

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Instructor: *Lili Grigorian*  
Term: Spring 2023

## Analyzing Real Life Scenarios through Linear and Exponential Functions using Open Pedagogy.



## Notes for Instructor

### Timeframe

**Start date:** After topics on linear and exponential growth are taught.

**Part I** is due in 1 week from the start date.

**Part II** is due in 2 weeks after Part I is due.

**Parts III** and **IV** are due in 1 week after Part II is due.

**Part V** along with **Parts I, II, III,** and **IV** in 2 weeks after Parts III and IV are due.

**End date:** One to two weeks before semester ends.

*Note: Before final submission instructor may provide feedback on Parts I – IV.*

### Submission Methods

**Part I:** Students will have a choice to upload on a platform of instructor's choice. (Ex. Dropbox, Blackboard, etc.) or on the class channel created on YouTube.

**Part II:** PDF documents uploaded on a platform of instructor's choice. (Ex. Dropbox, Blackboard, etc.)

**Part III:** Article to be annotated on <https://web.hypothes.is/start/> and video will be discussed in the group chat using app of student's choice. (Ex. googlechat, whatsapp, etc.)

**Part IV:** PDF documents uploaded on a platform of instructor's choice. (Ex. Dropbox, Blackboard, etc.)

**Part V:** Students will have a choice to upload on a platform of instructor's choice. (Ex. Dropbox, Blackboard, etc.) or on the class channel created on YouTube.

### Grading Policy

**Part I:** 10 points. Completed individually or in pairs.

**Part II:** 50 points. Completed in groups during class time.

**Parts III:** 10 points. Completed individually.

**Part IV:** 10 points. Completed individually.

**Part V:** 20 points. Completed individually.

Entire Project is worth 15 % of the course grade.

## Notes for Students

- Go to: <https://web.hypothes.is/start/> to create an account and annotate this project.
- Go to: [www.youtube.com](http://www.youtube.com) to create a college account if choosing an option to upload videos on YouTube.
- Verify your accounts on:  
Blackboard  
[https://ssologin.cuny.edu/cuny.html?resource\\_url=https%3A%2F%2Fbbhosted.cuny.edu%252F](https://ssologin.cuny.edu/cuny.html?resource_url=https%3A%2F%2Fbbhosted.cuny.edu%252F)  
DropBox  
<https://www.cuny.edu/about/administration/offices/cis/technology-services/dropbox/>
- Create a group chat on the app of your choice (must be only one app) and provide your instructor with the link.
- To make the material for this project suitable for our course, some parts associated with given scenarios in real life might be omitted and/or added.

**Part I: Digital Communication Ability.**

(10 points)

Record a 5–10-minute video that compares linear and exponential growth and a scenario from your everyday life which can be modeled by linear and/or exponential growth. Include a picture/description/video.

**Part II: Problem Solving and Inquiry Learning using Linear and Exponential Growth.** (50 points)

In part 2 of your project, you will learn, apply, and analyze linear and exponential growth by looking at the price of a smart phone. Smart phones have become part of our lives. Let us think about different options a person may buy a smartphone. We will expect the price to be \$720.

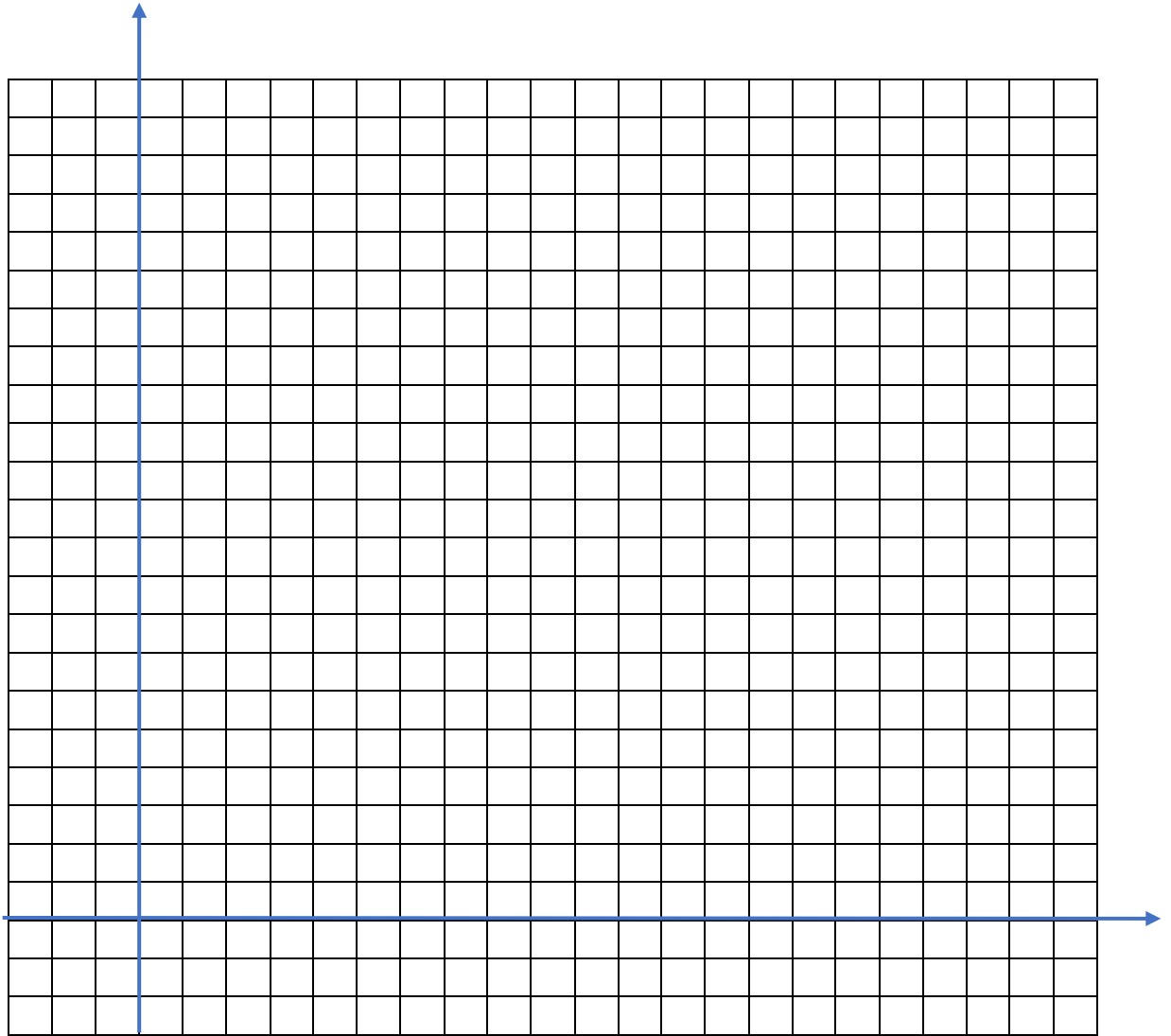
**Linear Functions.**

Assume you had decided to buy one of those phones from your cellular company, which requires you to make an initial payment up front and the balance (the original price of the phone) will be paid off monthly throughout 2 years (24 months) with **no** interest charged.



- Initial payment consists of paying taxes for the price of your phone. Calculate initial payment. **Note:** NYC sales tax is 8.875 %.
- Plot initial payment ( $t = 0$ ), also known as  $P_0$  (y-intercept), on the coordinate plane.
- Calculate the monthly payment.
- The dollar amount paid by you for this phone after the first month will be initial payment plus your monthly payment. Calculate the dollar amounts for the first five months.
- Plot the dollar amounts you paid for the phone for the first 5 months ( $t = 1, t = 2$ , etc.).
- Connect points. What graph resembles?
- What is the slope and the y-intercept of this graph?
- Describe what do y-intercept( $P_0$ ) and the slope (common difference) represent in context to this problem.
- Determine linear growth equation to model this scenario.

**Note:** May use graph paper provided below or your own or computer software to draw graph.



Make up at least two questions that you could answer by using the equation found in previous part.

- j) \_\_\_\_\_
- k) \_\_\_\_\_

## Exponential Functions.

Assume you had decided to buy one of those phones from a store and decided to pay upfront the sales taxes (8.875 %) using your debit card or cash and the total price for the phone using your credit card.



Assume there are three options to pay off your phone: Option 2 is listed below, make up scenario for Options 1 and 3.

**Option 1:** \_\_\_\_\_

**Option 2:** Paying off each month by making only minimum payments on your credit card. Interest will be charged.

**Option 3:** \_\_\_\_\_

**Note 1:** Minimum payment is \$30 or 2 % of the unpaid balance, whichever is greater.

**Note 2:** Interest will be calculated by using continuous compounding formula ( $A = P_0e^{rt}$ ).

Assume you choose option 2, your credit card has an APR (annual percentage rate) 21 %, and it was the only purchase made on this credit card for the next 2 years.

- Calculate the initial payment.
- The minimum payment is equal to \$30 or 2 % (whichever is greater) of the unpaid balance on your credit card. Calculate the minimum payment.
- The dollar amount paid by you for this phone after the first month will be initial payment (sales tax 8.875 %) plus your first monthly payment (the minimum payment). Calculate the dollar amounts for the first six months by filling out the table below.

**Note 1:** You need to check each time what will be your minimum payment \$30 or 2% (whichever is greater) of the unpaid balance on your card.

**Note 2:** You are calculating for a month, your  $t = \frac{1}{12}$

**Note 3:** Round to the nearest cent.

$t = \frac{1}{12}$     **A – min. payment**                      **I = A – P**                      **A = P<sub>0</sub>e<sup>rt</sup>**

Months	P (balance on your card at the beginning of the month)	I (interest accumulated at the end of the month)	A (balance on your card at the end of the month)
1 <sup>st</sup>			
2 <sup>nd</sup>			
3 <sup>rd</sup>			
4 <sup>th</sup>			
5 <sup>th</sup>			
6 <sup>th</sup>			

d) According to your results, will it take less or more time to pay off your phone than in Part 1? Will the difference be more significant in real life? Explain why?

Now assume that you choose Option 3 (whatever you made up for that option). Make up at least three questions regarding that option.

- a) \_\_\_\_\_
- b) \_\_\_\_\_
- c) \_\_\_\_\_



**Part III: Global Learning through Reading Articles and Watching Videos.**

*(10 points)*

Read the following article:

<https://www.nytimes.com/2022/07/01/your-money/credit-card-debt-economy.html>

Then annotate the above article.

Watch the following video:

<https://www.cnbc.com/2023/02/03/us-credit-card-debt-jumps-18point5percent-and-hits-a-record-930point6-billion-.html>

Create a group chat on an app of your choice and discuss the video.

**Part IV: Integrative Learning through Gathering Information via Interviewing.**

*(10 points)*

Interview people around you. You may interview your friends, family members, classmates, work colleagues, random people on the street, on social media, etc. You must select 10 or more respondents. Create a questionnaire with at least five questions related to credit cards that you would ask those people. Or use the sample below.

**SAMPLE**

Questionnaire

1. Age group:

18 – 30            31 – 40            41 – 50            51 – 60            61 – 70            71 – above

2. Education level:

High school diploma    Associate degree    Bachelor’s degree    Master’s degree or higher

3. Work status:

Full-time            Part-time            Not employed            Retired

4. Have a credit card?            How many?

5. Which of the options described in Part 2, do they usually choose when buying on credit cards?

Option 1            Option 2            Option 3

6. Looking back 5 – 10 years ago, do they use credit cards more or less?

7. Are they satisfied with the choices they were making with credit cards?

8. If they could go back 5 – 10 years, would they make other choices with credit cards?

**Part V: Reflection through Digital/Writing/Oral Communication Ability.**

*(20 points)*

After completing this project, you formed a view regarding linear and exponential growth and how it affects paying off your balance. You had a chance to examine, analyze, and rethink the financial choices you and people around you make, and how those choices affect you and your community, globally. Create either:

- **Record** at least a 10-minute-long video reflection.
- **Write** at least a 2-page-long (size 12, double spaced) written reflection.
- **Present** at least 10-minute-long oral presentation in class.

Reflection of your choice should include the following, but not limited to:

- Think of another scenario from your everyday life which can be modeled by linear and/or exponential functions. Include a picture/description/video.
- Compare linear and exponential growth.
- How age, education level, and work status affect people's financial choices and beliefs.
- Credit cards have become important parts of our lives, and we need to know how to use them. Describe advantages and disadvantages of using them.
- How this project is related to your studies at Kingsborough CC.
- How your financial views and beliefs have changed after completing this project.
- Ways you would take to improve your financial situation, 5 – 10 years from now.
- How our financial choices and financial choices of people around you affect our community and the World around us.

*The End.*