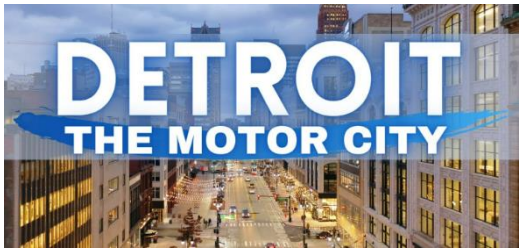
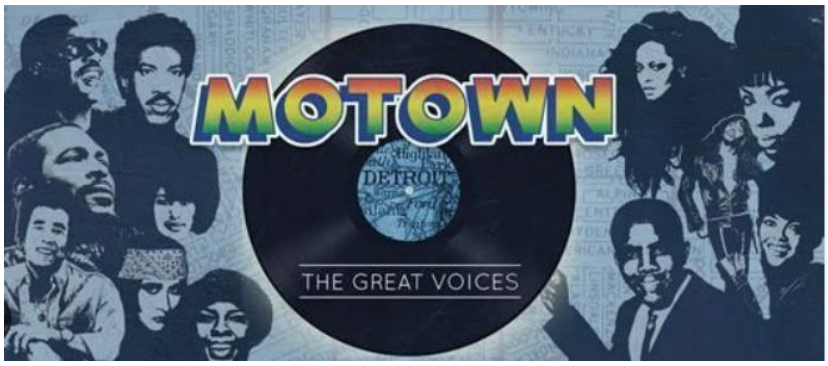
PROBLEM 1:

Random Fact: Ms. Rossi was born in Detroit and lived there until she was 4.



Another fact: Did you the name MOTOWN (a style of upbeat R&B music associated with Detroit and numerous Black vocalists) comes from the name MOTOR TOWN (said quickly)?



The expansion of the auto industry nearly a century ago fueled a population growth spurt that made Detroit the **fourth** largest city in the country. By 1950, the population peaked at almost 1.85 million as people moved to Detroit to work at the Big Three auto companies: Ford, General Motors, and Chrysler. However, several decades later, Detroit collapsed as it went from one of America's most prosperous cities to one of its most distressed. Main causes: financial missteps, huge racial tensions, leadership issues. Detroit filed for bankruptcy in 2013. We will focus on the decade 2000 to 2010, when Detroit had one of biggest population declines ever recorded in US history. Let's assume that the population decreased exponentially during this decade, and let's let t be the number of years since 2000 and $P(t)$ be the number of people in Detroit in thousands, since year 2000. Given the population of 894.8 thousand people in 2002 and 701.29 thousand people in 2010, write an exponential equation to model the population of Detroit since 2000.

Part b) Using your equation, state the percent decrease in population each year.

Part c) Using your equation, state the percentage of people that remained in the city each year.

Part d) By what percent did the population decrease from the year 2000 to the year 2010? Show what you did!

Part e) Graph your model on your graphing calculator. According to your equation, when did the population hit 650 thousand people?

PROBLEM 2:

Don't Mess With Texas – especially now that its population is BOOMING. In 2021, on a list of the top 5 cities in the US with highest population growth, 3 of those cities were in Texas! Let's focus on Georgetown, a central city which was the fastest-growing city in the US in 2022 (for cities with a population above 50,000) according to data released today by the US Census Bureau. As Major Josh Schroeder said himself – "People don't just move here: They fall in love with this town for its good jobs, safe neighborhoods, and uneatable parks and events!"

Let's assume that the population has increased exponentially since 1990, and let's let t be the number of years since 1990 and $P(t)$ be the number of people in Georgetown since year 1990. Given the population of 86,507 people in 2022 and 21,254 people in 1995, write an exponential equation to model the population of Georgetown since 1990.

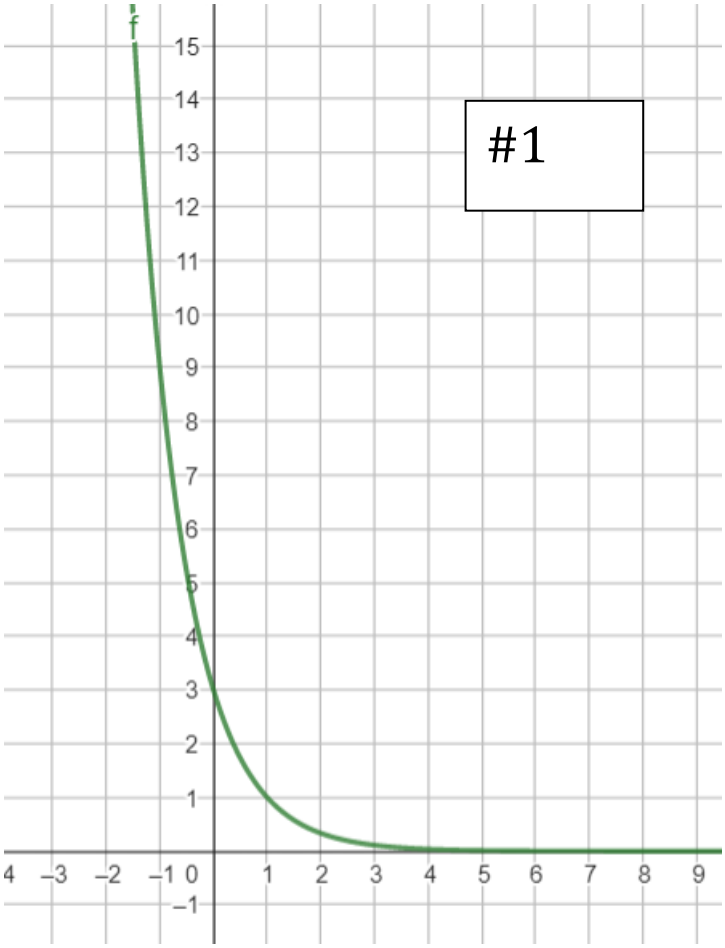
Part b) What is the predicted population in 1990?

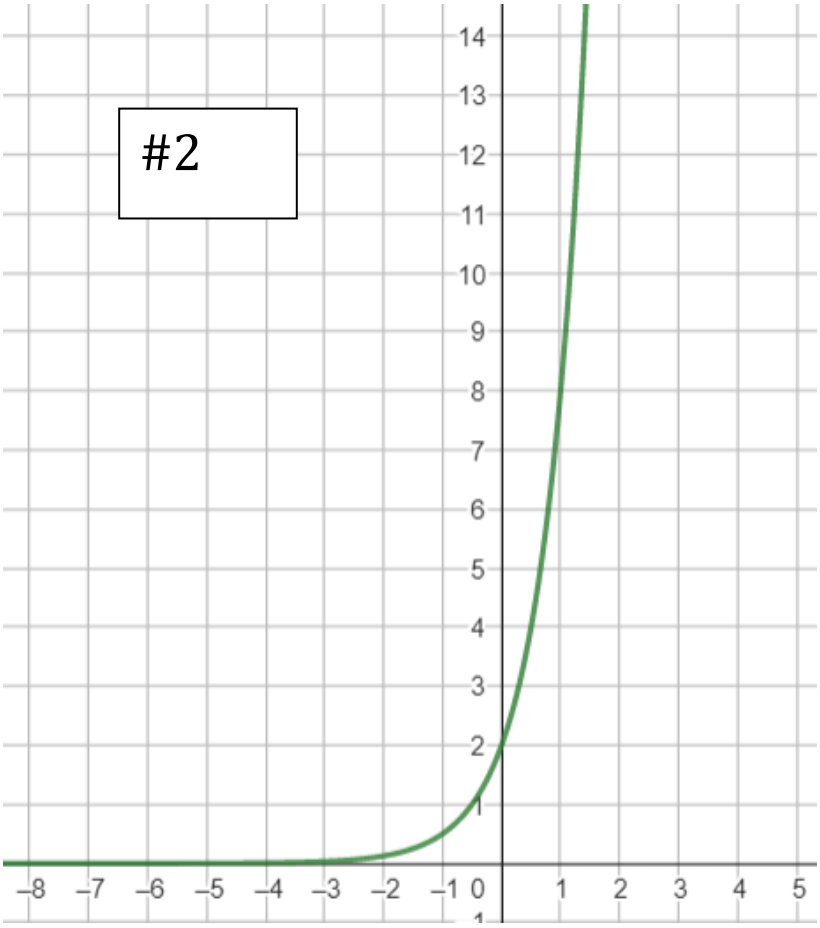
Part c) By what percentage does the population increase per year, according to your model?

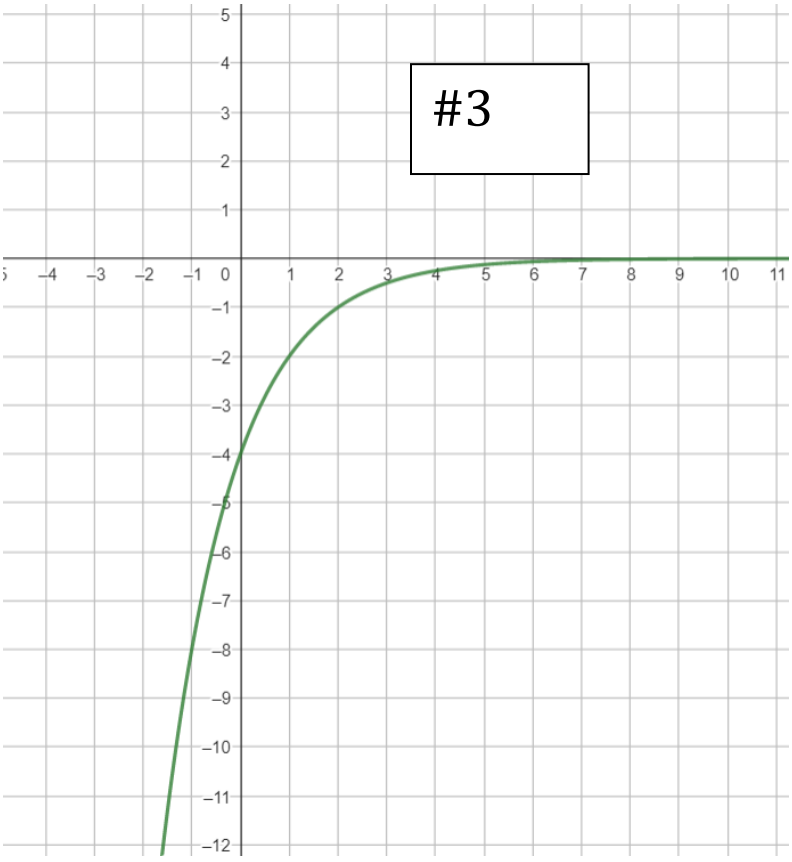
Part c) What is the percent increase in population 1995 to 2022? Show what you did!

Part d) What is the expected population of Georgetown this year, according to your model?

PROBLEM 3: Write the equation of each graph (no work needed!)







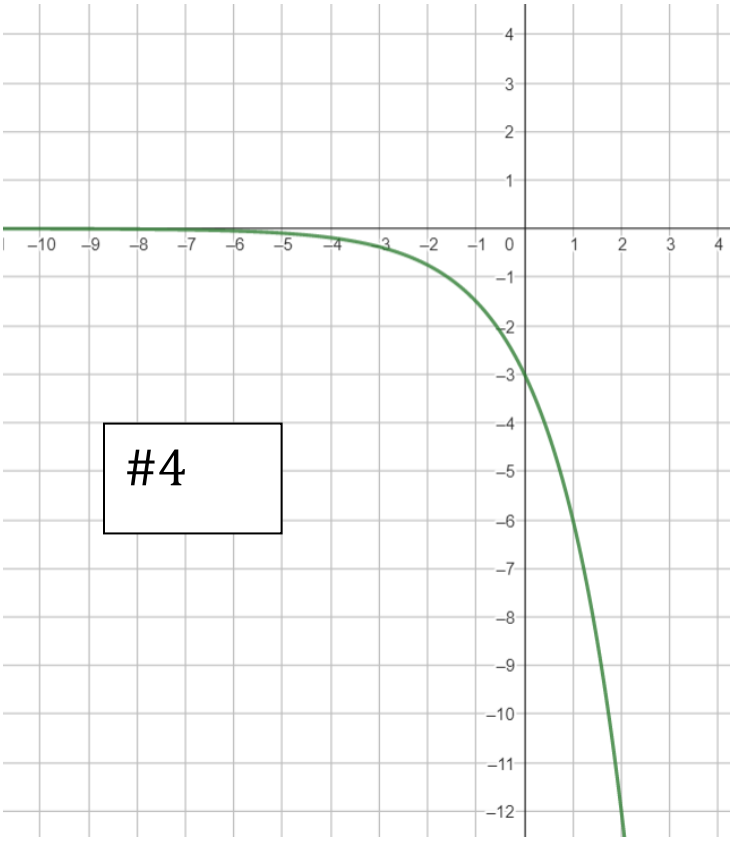


Table 4.12 shows global wind energy generating capacity, W (in megawatts), as a function of the number of years, t, since 1995.[16]

a) Plot the data on your graphing calculator and adjust your window to see all the data points and your axes clearly (BOTH PARTNERS PLEASE!)

Table 4.12

t	0	1	2	3	4	5	6	7	8	9
W	4780	6070	7640	10,150	13,930	18,450	24,930	32,037	39,664	47,760

b) Use a graphing calculator to fit an exponential curve to the data (ExpReg) and write down your equation to three decimal places

c) What annual percent growth does your exponential model show?

d) Predict the global wind energy capacity in 2006.

e) According to your model, when will the global wind energy capacity be 60,000? BOTH PARTNERS SHOW ME!

PROBLEM 5:

Simplify $p(x)$ below to write it in the form ae^x:

$$p(x) = \frac{7e^{6x} \cdot \sqrt{e} \cdot (2e^x)^{-1}}{10e^{4x}}$$

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PROBLEM 3:

Ms. Rossi hates bathroom duty.

Ms. Rossi sits outside a bathroom 4 – 5 times per week chasing students out of the bathroom.

How often does Ms. Rossi see a haze of fruity smoke each time? ALL THE TIME.

All the cool kids vape in the bathroom, and vaping e-cigs can't possibly be bad for you, because they smell like fun things like mint, candy, fruit, chocolate, and rainbow unicorns.

E-cigarettes heat a liquid into an aerosol that the user inhales. The liquid usually has nicotine and flavoring in it, along with other additives like chemicals and heavy metals like nickel and lead. Ultrafine particles in the aerosol can be inhaled deep into the lungs, and vaping can cause lung damage and lung disease.

Guess what's not cool? Fighting lung disease as an adult. You know which organ transplant is among the least successful? Lung transplants – there's only a 50-60% success rate with the surgery and only an average 5-year life expectancy after getting a new lung. PROTECT YOUR LUNGS!

Let's get to the data. In 2022, more than 1 in 4 US teens used e-cigarettes daily.