1) **GOAL**: Graph $h(x) = 2\left(\frac{1}{5}\right)^x - 3$.

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3) **GOAL**: Graph $h(x) = (3)^{x-2} - 4$.

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Horizontal Asymptote	$y =$ ___	$y =$ ___	$y =$ ___

4) **GOAL**: Graph $h(x) = \left(\frac{1}{4}\right)^{-x} - 5$.

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7) EXPONENTIAL GROWTH MODEL: When a real-life quantity increases by a fixed percent each year (or time period), the amount y of the quantity after t years can be modeled by the equation

$$f(x) = a(1 + r)^t$$

where a is the **initial amount** and r is the **percent increase** expressed as a **decimal**.
$(1 + r)$ is called the **growth factor**.

After the insecticide DDT was used extensively after the mid-1940s, Bald Eagle populations declined catastrophically. DDT caused the eggshells to become so thin that they would easily break. By 1963, only 417 nesting pairs were found in the lower 48 states. DDT was banned from use in the United States in 1972 and in Canada in 1973, making it possible for recovery programs to be successful (source: American Eagle Foundation).

DO YOU KNOW WHAT DDT STANDS FOR?? Wait for it…

Dichlorodiphenyltrichloroethane, commonly known as DDT, is a colorless, tasteless, and almost odorless crystalline chemical compound, an organochloride. Originally developed as an insecticide, it became infamous for its environmental impacts.

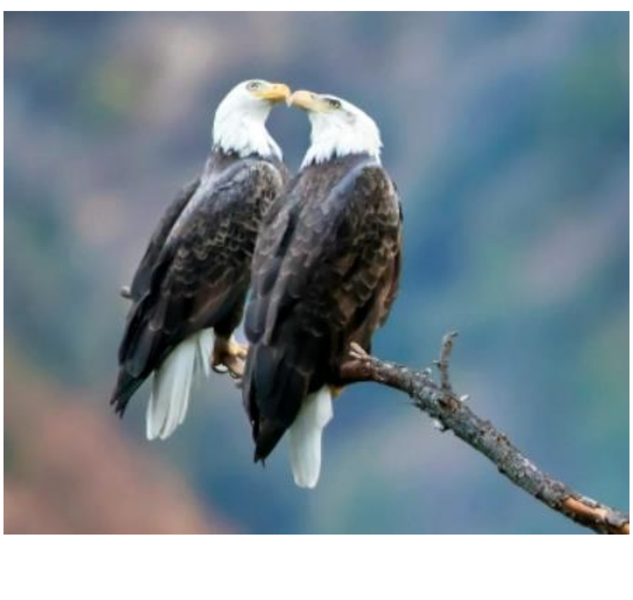
Okay, back to the problem. Suppose that over the next 34 years, the number of nesting pairs increased by about 8.9% each year.

1) Write an equation to model the number of nesting pairs in the lower 48 states t years after 1963. Graph this on your graphing calculator (BOTH PARTNERS PLEASE!)

2) What is the growth factor?

3) Based on your model, how many nesting pairs were there in 1996? (show plugging in work)

4) Use the graph to find an estimate for the year when there were 600 nesting pairs (BOTH PARTNERS SHOW ME PLEASE!)



8) EXPONENTIAL DECAY MODEL: When a real-life quantity decreases by a fixed percent each year (or time period), the amount y of the quantity after t years can be modeled by the equation

$$f(x) = a(1 - r)^t$$

where a is the **initial amount** and r is the **percent decrease** expressed as a **decimal**.
$(1 - r)$ is called the **decay factor**.

CAR DEPRECIATION

WHAT is depreciation for a car? All cars **lose value** as they age. How fast do cars depreciate per year? **Within the first year, many cars will lose up to 20% of their value. After that, they may lose about 15% more per year until the four-or five-year mark**. After that, their value levels off.

LOW depreciation cars hold their value well over time: Jeep Wrangler, Honda Civic, Toyota Tacoma, Toyota Corolla

HIGH depreciation cars lose their value quickly: BMW, Maserati, Jaguar, Escalade, Mercedes Benz

The average depreciation rate for a car is about 16.5% a year (what the banks use to value your assets) or about 18.75% (depends on what source you look up).

1) If a car depreciates at 18.75% a year, that means that with each passing year, it is only worth ______% of the previous year (write this blank down on the board).

2) Using 18.75% depreciation, write an exponential model for the current value, $V(t)$, of a car t years after it was made.

3) During Covid summer 2020, I sold my beloved 2001 For Explorer because it was falling apart. I bought a used 2019 Honda Pilot from a dealership (just slightly used). When it was brand-new in 2019, my car was priced at $31,450. Use your model to determine how much my car is worth this year (show plugging in work).

4) Use your graphing calculator to predict when my Pilot will be worth $10,000 (BOTH PARTNERS SHOW ME PLEASE!)

9) EXPONENTIAL DECAY MODEL: Radioactive dating, or Carbon-14, is used for dating fossils and estimating the age of organic compounds. The technique is based on the decay of the carbon-14 **isotope**. Carbon decays slowly in a living organism, but the amount lost is continually replenished as long as the organism takes in air or food.

Once the organism dies, it no longer absorbs Carbon-14, so the amount of carbon in its tissues decreases. Because Carbon-14 decays constantly, you can estimate when an organism died by measuring the amount of Carbon-14 left in the fossils.

Over time, radioactive Carbon-14 decays into a stable form. The decay rate is 11.4% every 1000 years. List your answers on your board (Don't erase any until I check!)

1) If we start with a 200-microgram sample of Carbon-14, find the amount of Carbon-14 remaining:

After 1000 years	________________ micrograms of Carbon left
After 2000 years	________________ micrograms of Carbon left
After 3000 years	________________ micrograms of Carbon left

2) Write a formula for the quantity, Q, of a 200-microgram sample remaining as a function of time, t, in thousands of years. Graph this on your graphing calculator (BOTH PARTNERS PLEASE!)

3) Estimate when there are 25 micrograms of Carbon-14 left of our 200-microgram sample (BOTH PARTNERS SHOW ME PLEASE!)

4) Let's create another equation using the fact that Carbon-14 decays at an **annual** rate of 0.0121% **per year**. Write a formula for the quantity, Q, of a 125-microgram sample remaining after t years.

5) Find the amount of Carbon-14 remaining:

After 1 year	________________ micrograms of Carbon left
After 2 years	________________ micrograms of Carbon left
After 3 years	________________ micrograms of Carbon left