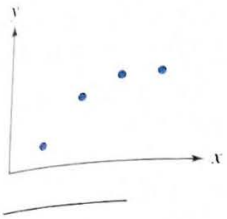
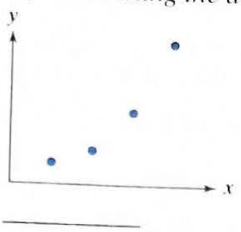
For each of the scatter plots in Exercises 4–6, determine whether an exponential function, a logarithmic function, or a linear function is the best choice for modeling the data.

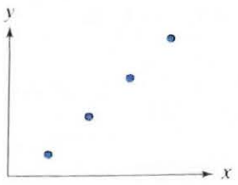
4.



5.



6.



7. $y = 3(5)^x$ can be written in terms of base e as $y = 3e^{(\_)x}$.

EXERCISE SET 4.5

Practice Exercises and Application Exercises

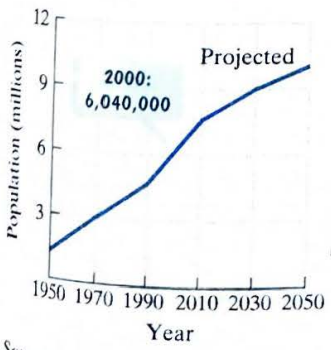
The exponential models describe the population of the indicated country, A, in millions, t years after 2010. Use these models to solve Exercises 1–6.

India	$A = 1173.1e^{0.008t}$
Iraq	$A = 31.5e^{0.019t}$
Japan	$A = 127.3e^{-0.006t}$
Russia	$A = 141.9e^{-0.005t}$

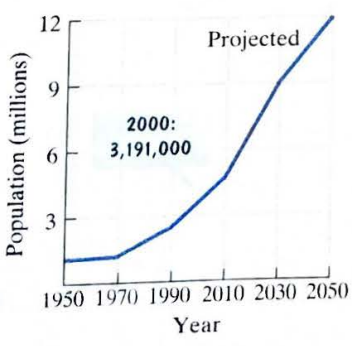
1. What was the population of Japan in 2010?
2. What was the population of Iraq in 2010?
3. Which country has the greatest growth rate? By what percentage is the population of that country increasing each year?
4. Which countries have a decreasing population? By what percentage is the population of these countries decreasing each year?
5. When will India's population be 1377 million?
6. When will India's population be 1491 million?

About the size of New Jersey, Israel has seen its population soar to more than 6 million since it was established. The graphs show that by 2050, Palestinians in the West Bank, Gaza Strip, and East Jerusalem will outnumber Israelis. Exercises 7–8 involve the projected growth of these two populations.

Population of Israel



Palestinian Population in West Bank, Gaza, and East Jerusalem



Source: *Newsweek*

7. a. In 2000, the population of Israel was approximately 6.04 million and by 2050 it is projected to grow to 10 million. Use the exponential growth model $A = A_0e^{kt}$, in which t is the number of years after 2000, to find an exponential growth function that models the data.

b. In which year will Israel's population be 9 million?

8. a. In 2000, the population of the Palestinians in the West Bank, Gaza Strip, and East Jerusalem was approximately 3.2 million and by 2050 it is projected to grow to 12 million. Use the exponential growth model $A = A_0e^{kt}$, in which t is the number of years after 2000, to find the exponential growth function that models the data.

b. In which year will the Palestinian population be 9 million?

In Exercises 9–14, complete the table. Round projected populations to one decimal place and values of k to four decimal places.

	Country	2010 Population (millions)	Projected 2050 Population (millions)	Projected Growth Rate, k
9.	Philippines	99.9		0.0095
10.	Pakistan	184.4		0.0149
11.	Colombia	44.2	62.9	
12.	Madagascar	21.3	42.7	
13.	Germany	82.3	70.5	
14.	Bulgaria	7.1	5.4	

Source: International Programs Center, U.S. Census Bureau

An artifact originally had 16 grams of carbon-14 present. The decay model $A = 16e^{-0.000121t}$ describes the amount of carbon-14 present after t years. Use this model to solve Exercises 15–16.

15. How many grams of carbon-14 will be present in 5715 years?
16. How many grams of carbon-14 will be present in 11,430 years?

17. The half-life of the radioactive element krypton-91 is 10 seconds. If 16 grams of krypton-91 are initially present, how many grams are present after 10 seconds? 20 seconds? 30 seconds? 40 seconds? 50 seconds?
18. The half-life of the radioactive element plutonium-239 is 25,000 years. If 16 grams of plutonium-239 are initially present, how many grams are present after 25,000 years? 50,000 years? 75,000 years? 100,000 years? 125,000 years?