Algebra 1

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Review Unit 5 Lesson 2

5 Radioactive materials have many important uses in the modern world, from fuel for power plants to medical x-rays and cancer treatments. But the radioactivity that produces energy and tools for "seeing" inside our bodies can have some dangerous effects too; for example, it can cause cancer in humans.

The radioactive chemical *strontium-90* is produced in many nuclear reactions. Extreme care must be taken in transport and disposal of this substance. It decays slowly—if an amount is stored at the beginning of a year, 98% of that amount will still be present at the end of the year.

a. If 100 grams (about 0.22 pounds) of strontium-90 are released by accident, how much of that radioactive substance will still be around after 1 year? After 2 years? After 3 years?

1yr: $100(.98) = 98$ grams

2yr: $98(.98) = 96$ grams

3yr: $96(.98) = 94.1$ grams

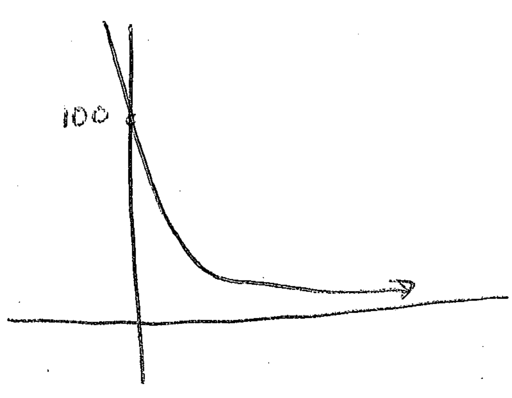
b. Write two different rules that can be used to calculate the amount of strontium-90 remaining from an initial amount of 100 grams at any year in the future.

Next = Now(.98) SA 100

$y = 100(.98)^x$

c. Make a table and a graph showing the amount of strontium-90 that will remain from an initial amount of 100 grams at the end of every 10-year period during a century.

Years Elapsed	0	10	20	30	40	50	60	...
Amount Left (in g)	100	81.7	66.8	54.5	44.6	36.4	29.8	



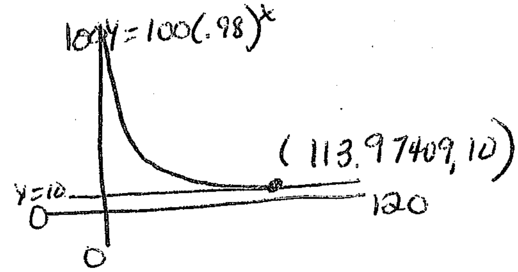
d. Find the amount of strontium-90 left from an initial amount of 100 grams after 15.5 years.

x	$y = 100(.98)^x$
15	73.857
15.5	73.12
16	72.38

73.12 grams

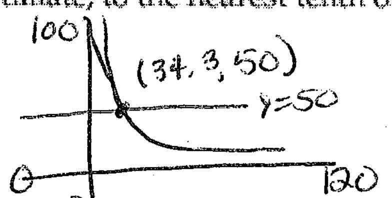
e. Find the number of years that must pass until only 10 grams remain.

x	y
113.5	10.096
114	9.9948
114.5	9.8943



114 years

f. Estimate, to the nearest tenth of a year, the half-life of strontium-90.



34.3 years

5 **Fractional Powers and Radicals** In Lesson 2, you also discovered and practiced use of expressions in which fractional powers occur. Special attention was paid to square roots, using the exponent one-half. Use what you learned to answer these questions.

a. The value of $3^2 = 9$ and $3^3 = 27$. What does this information tell about the approximate values of $3^{2.4}$ and $3^{2.7}$?

$3^{2.4}$ is closer to 9 because 2.4 is closer to 2 than 3

$3^{2.7}$ is closer to 27 because 2.7 is closer to 3 than 2

b. For each of these equations, find two different pairs of integer values for a and b that make the equation true.

i. $\sqrt{48} = a\sqrt{b}$ $\quad \sqrt{48} = 4\sqrt{3} = 2\sqrt{12}$

ii. $\sqrt{a}\sqrt{b} = \sqrt{36}$ $\quad \sqrt{4}\sqrt{9} = \sqrt{36}$

or $\sqrt{1}\sqrt{36} = \sqrt{36}$

or $\sqrt{2}\sqrt{18} = \sqrt{36}$

or $\sqrt{3}\sqrt{12} = \sqrt{36}$

4 Exponent Properties In Lessons 1 and 2, you discovered and practiced several principles for writing exponential expressions in equivalent (often simpler) forms. Use those principles to find values of x and y that make the following equations true statements.

a. $(2.3^5)(2.3^3) = 2.3^x$

$5 + 3 = 8 = x$

b. $2.3^x = 1$

$x = 0$

c. $(3.5^x)^y = 3.5^{12}$

$x \cdot y = 12$

$3 \cdot 4 = 12$

$2 \cdot 6 = 12$

$1 \cdot 12 = 12$

d. $\frac{7^9}{7^4} = 7^x$

$9 - 4 = 5 = x$

e. $\frac{7^x}{7^4} = 7^2$

$x - 4 = 2$

$x = 6$

f. $(7^3)^x = 7^6$

$3 \cdot x = 6$

$x = 2$

g. $\left(\frac{3}{5}\right)^4 = \frac{3^x}{5^y}$

$x = 4$

$y = 4$

h. $(4a)^3 = 4^x a^y$

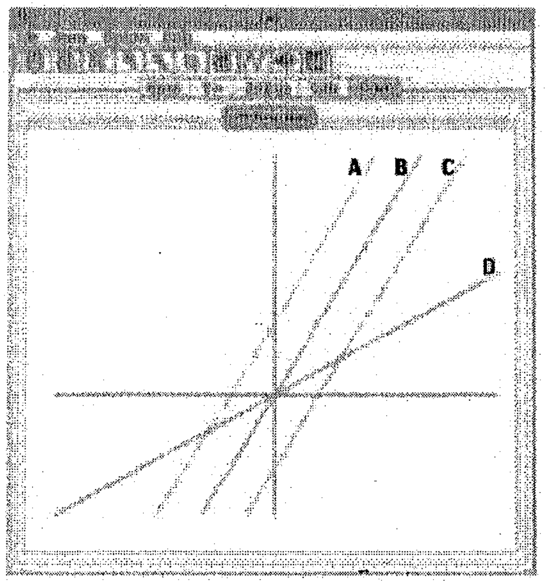
$x = 3 / y = 3$

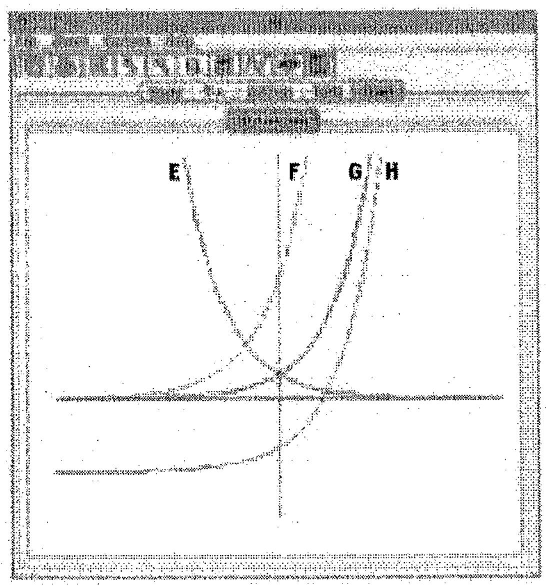
i. $\frac{1}{7^4} = 7^x$

$x = {}^{-}4$

6 The graphs and tables below model linear and exponential growth or decay situations.

a. Without the use of technology, match each graph with its corresponding table. In each case, describe the clues that you used to match the items.





Graph B
$y=3x$

Table 1:

x	−3	−1	1	3
y	−9	−3	3	9

Table 2:

x	−3	−1	1	3
y	−3	−1	1	3

Graph D
$y=x$

Graph E
$y=\left(\frac{1}{3}\right)^x$

Table 3:

x	−3	−1	1	3
y	27	3	$\frac{1}{3}$	$\frac{1}{27}$

Table 4:

x	−3	−1	1	3
y	$\frac{1}{27}$	$\frac{1}{3}$	3	27

Graph G
$y=3^x$

Graph A
$y=3x+3$

Table 5:

x	−3	−1	1	3
y	−6	0	6	12

Table 6:

x	−3	−1	1	3
y	$\frac{5}{27}$	$\frac{5}{3}$	15	135

Graph F
$y=5(3)^x$

Graph C
$y=3x-3$

Table 7:

x	−3	−1	1	3
y	−12	−6	0	6

Table 8:

x	−3	−1	1	3
y	$-\frac{80}{27}$	$-\frac{8}{3}$	0	24

Graph H
$y=3^x-3$

b. Without using technology, write "$y = \ldots$" rules for each of the graph/table pairs you matched in Part a. For linear function rules of the form $y = a + bx$ and exponential function rules of the form $y = c(d^x) + e$, use your knowledge of what the numbers a, b, c, d, and e tell you about patterns in graphs and table values. Then check using technology.