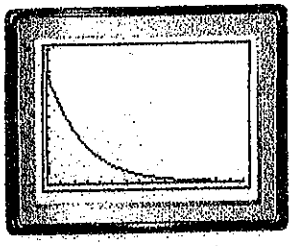
Mathematics Integrated Algebra II Name: _____

Using Exponential Functions to Solve Problems

MOTION PICTURES Movies tend to have their best ticket sales the first weekend after their release. The sales then follow a decreasing exponential function each successive weekend after the opening. The function $E = 49.9 \cdot 0.692^w$ models the earnings of a popular movie. In this equation, E represents earnings in millions of dollars and w represents the weekend number.

1. a. Graph the function. What values of E and w are meaningful in the context of the problem?

Use a graphing calculator to graph the function. Only values where $E \leq 49.9$ and $w > 0$ are meaningful in the context of the problem.



[0, 15] scl: 1 by [0, 60] scl: 5

b. How much did the movie make on the first weekend?

c. How much did it make on the fifth weekend?

2. Determine whether each set of data displays exponential behavior.

a.

x	0	10	20	30	40	50
y	80	40	20	10	5	2.5

Method 1 Look for a Pattern

Method 2 Graph the Data

b.

[redacted]	0	10	20	30	40	50
[redacted]	15	21	27	33	39	45

Method 1 Look for a Pattern

Method 2 Graph the Data

3. *Exponential Growth*

SPORTS In 1971, there were 294,105 females participating in high school sports. Since then, that number has increased an average of 8.5% per year.

a. Write an equation to represent the number of females participating in high school sports since 1971.

b. According to the equation, how many females participated in high school sports in the year 2001?

4. *Exponential Decay*

ENERGY In 1950, the use of coal by residential and commercial users was 114.6 million tons. Many businesses now use cleaner sources of energy. As a result, the use of coal has decreased by 6.6% per year.

a. Write an equation to represent the use of coal since 1950.

b. Estimate the estimated amount of coal that will be used in 2015.

5. *Depreciation*

FARMING A farmer buys a tractor for $50,000. If the tractor depreciates 10% per year, find the value of the tractor in 7 years.

Extra Information

One special application of exponential growth is **compound interest.** The equation for compound interest is $A = P\left(1 + \frac{r}{n}\right)^{nt}$, where A represents the amount of the investment, P is the principal (initial amount of the investment), r represents the annual rate of interest expressed as a decimal, n represents the number of times that the interest is compounded each year, and t represents the number of years that the money is invested.

Compound Interest

HISTORY **Use the information at the left. If the money the Native Americans received for Manhattan had been invested at 6% per year compounded semiannually, how much money would there be in the year 2026?**

$A = P\left(1 + \frac{r}{n}\right)^{nt}$	Compound interest equation
$A = 24\left(1 + \frac{0.06}{2}\right)^{2(400)}$	$P = 24$, $r = 6\%$ or 0.06, $n = 2$, and $t = 400$
$A = 24(1.03)^{800}$	Simplify.
$A \approx 4.47 \times 10^{11}$	There would be about \$447,000,000,000.