EXTRA REVIEW

Graph each of the following exponential functions. Classify each function as exponential growth or decay. Indicate the y-intercept and the growth/decay factor.

1. \( y = 7 \cdot 0.2^x \)

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>175</td>
</tr>
<tr>
<td>-1</td>
<td>35</td>
</tr>
<tr>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>1</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>0.28</td>
</tr>
</tbody>
</table>

growth/decay: growth
y-int: (0, 7)
factor: \( 0.2 \)

2. \( y = 0.2 \cdot (4)^x \)

<table>
<thead>
<tr>
<th>x</th>
<th>y</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>0.0125</td>
</tr>
<tr>
<td>-1</td>
<td>0.05</td>
</tr>
<tr>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>1</td>
<td>0.8</td>
</tr>
<tr>
<td>2</td>
<td>3.2</td>
</tr>
</tbody>
</table>

growth/decay: decay
y-int: (0, 0.2)
factor: \( 4 \)

Write exponential functions given the following scenarios.

3. A business had a profit of $35,000 in 1998 that increased by 18% per year. Write the equation to model the situation. Find the profit of the company after 8 years.

\[
y = 35000 \cdot (1.18)^x
\]

\( x = 8 \)
\( y = 131560.07 \)

4. You buy a used truck for $4,000. The value of the truck depreciates at a yearly rate of 12%. Write the equation to model the situation. Find the value of the truck after 6 months.

\[
y = 4000 \cdot (0.88)^x
\]

\( x = 0.5 \)
\( y = 3752.33 \)

5. Between 1970 and 2000, the population of a town increased by approximately 2.5% each year. In 1970 there were 600 people. Write the equation to model the situation. Find the population of the city in 1999.

\[
y = 600 \cdot (1.025)^x
\]

\( x = 29 \)
\( y = 1227.84 \)

Determine whether the following scenarios would be best modeled using a linear or exponential model. Then, write an equation.

6. Ms. Hunter takes off 10 points for each day an assignment is turned in late. The assignments are worth 100 points each.

\[
y = -10x + 100
\]

linear!

7. There are 200 ladybugs in a certain population. The population is decreasing by 14% per day.

\[
y = 200 \cdot (0.86)^x
\]

Exponential!

8. Your salary starts at $23000 and goes up by 5% per year.

\[
y = 23000 \cdot (1.05)^x
\]

Exponential!

9. A painter is going to charge $90 for paint and $35 an hour to paint your kitchen.

\[
y = 35x + 90
\]

linear!
10. The following formulas each describe the size of UNCC basketball fan attendance, $F$, in $t$ weeks since the start of the season. Describe the changes for each fan base in words.

- *(a)* $P = 50(1.2)^t$ Initial 50, growing by 27% per week
- *(b)* $P = 500 - 20t$ Initial 500, decreasing by 2.0 fans per week
- *(c)* $P = 2000(0.64)^t$ Initial 2000, decaying by 36% per week
- *(d)* $P = 1600 + 15t$ Initial 1600, increasing by 15 fans per week

11. Decide whether the function in the following tables could be linear or exponential or neither. Write the function.

- **a.**
  
<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>125</td>
<td>150</td>
<td>180</td>
<td>216</td>
</tr>
</tbody>
</table>
  
  $y = 125(1.2)^x$

- **b.**
  
<table>
<thead>
<tr>
<th>$x$</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>$f(x)$</td>
<td>16</td>
<td>24</td>
<td>32</td>
<td>40</td>
</tr>
</tbody>
</table>
  
  $y = 8x + 16$

12. The table below shows the end monthly balance in a checking account. Determine which model best represents the data and write an equation to describe the data.

<table>
<thead>
<tr>
<th>Month</th>
<th>Balance (dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53</td>
</tr>
<tr>
<td>2</td>
<td>123</td>
</tr>
<tr>
<td>3</td>
<td>187</td>
</tr>
<tr>
<td>4</td>
<td>251</td>
</tr>
</tbody>
</table>

13. Suppose you put marbles into a cup hanging from a rubber band. The distance $d$ from the floor in centimeters it gets is measured as the number $n$ of marbles is increased. The data is recorded in the table below. Determine which model best represents the data and write an equation to describe the data. If this pattern continues, what is the minimum number of marbles needed to make the cup reach the floor?

<table>
<thead>
<tr>
<th>$n$</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d$</td>
<td>43.5</td>
<td>41</td>
<td>38.5</td>
<td>36</td>
<td>33.5</td>
<td>31</td>
</tr>
</tbody>
</table>

14. Determine whether the following sequences are arithmetic or geometric. Then, write a NEXT/NOW formula to fit the sequence.

- **a.** 3, 6, 12, 24, ...
  
  geometric
  
  NEXT = 2 · NOW

- **b.** 9, 3, 1, $\frac{1}{3}$, ...
  
  geometric
  
  NEXT = $\frac{1}{3}$ · NOW

- **c.** 1, -6, -13, -20, ...
  
  arithmetic
  
  NEXT = NOW - 7

- **d.** 1, -4, 16, -64, ...
  
  geometric
  
  NEXT = -4 · NOW

- **e.** 17, 22, 27, 32, ...
  
  arithmetic
  
  NEXT = NOW + 5

- **f.** 12, 3, $\frac{3}{4}$, $\frac{3}{16}$, ...
  
  geometric
  
  NEXT = $\frac{1}{4}$ · NOW