Worksheet B: (Topic 2.2) Linear and Exponential Functions Name: Solutions

Directions: Selected values of several functions are given in the table below. For each table, determine if the function could be linear, exponential, or neither. Give a reason for your answer.

1.

x	$f(x)$	
1	3	
2	6	$\times 2$
3	12	$\times 2$
4	24	$\times 2$
5	48	$\times 2$

exponential because over equal-length input-value intervals, the output values of $f(x)$ change proportionally.

2.

x	$g(x)$	
0	1	
1	2	1
2	5	3
3	10	5
4	17	7

Neither because over equal-length input-value intervals, the output values of $g(x)$ do not change at a constant rate or proportionally.

3.

x	$h(x)$	
0	27	
5	9	$\div 3$
10	3	$\div 3$
15	1	$\div 3$
20	$\frac{1}{3}$	$\div 3$

exponential because over equal-length input-value intervals, the output values of $h(x)$ change proportionally.

4.

x	$k(x)$	
2	12	
5	9.5	-2.5
8	7	-2.5
11	4.5	-2.5
14	2	-2.5

Linear because over equal-length input-value intervals, the output values of $k(x)$ change at constant rate.

5. After a small group of rabbits are introduced into a wooded area, their population begins to grow. The number of rabbits living in the area can be modeled using a geometric sequence, where one month after they are introduced to the area is month 1. At month 3, the population of rabbits in the area is 64, and by month 6 the total population of rabbits in the area grew to 343. Using this model, how many rabbits will be in the wooded area by month 11?

$R(t)$ = the number of rabbits living in the area at month t $\quad R(3) = 64 \quad R(6) = 343$

$R(t) = R(3)r^{(t-3)} = 64r^{(n-3)} \quad R(6) = 64r^{(6-3)} = 343$

$$64r^{(3)} = 343 \Rightarrow r^3 = \frac{343}{64} \Rightarrow r = \left(\frac{343}{64}\right)^{\frac{1}{3}} = \frac{7}{4} \qquad P(t) = 64\left(\frac{7}{4}\right)^{(t-3)}$$

$P(11) = 64\left(\frac{7}{4}\right)^{(11-3)} = 64\left(\frac{7}{4}\right)^{(8)} = 5629.6884$ ... About 5630 rabbits will be in the wooded area by month 1.

6. After the world noticed the sweet calculator watch Mr. Passwater was wearing one day, everyone began wanting to emulate him and get their own calculator watch. As a result, one factory had to build an industrial machine to help manufacture and package the watches so they could be shipped to customers around the world. In a certain simulation, the total number of watches the machine could produce after n hours can be modeled using an arithmetic sequence. The machine had produced 4306 watches after 2 hours, and 15,071 total watches after 7 hours. Based on the simulation, how many total watches will the machine produce by the end of hour 12?

$W(n)$ = the total number of watches the machine produced after n hours

d is the constant difference of the arithmetic sequence

$W(n) = W(2) + (n-2)d = 4306 + (7-2)d = 4306 + (5)d = 15071$

$$d = \frac{15071 - 4306}{5} = \frac{10765}{5} = 2153 \qquad W(12) = 4306 + 2153(12-2) = 25836$$

25837 watches will be produced by the end of hour 12.