Name: Key Hour:

Algebra 2: Module 1 Unit REVIEW (Linear and Exponential Functions)

1. A new watch that sells for \$275.99 is worth \$264.59 one year later. Find the exponential function that represents this scenario. What will the watch be worth after 4 years? $f(x) = (275.99)(.959)^x$ } $f(4) = \$233.44$

2. Is the following relation a function? Explain how you can tell: $\{(2,2),(-2,4),(11,6),(6,0),(1,4)\}$

   Function: All x matched up with one y.

3. Write the domain and range of the relation listed in #3:

   Domain: $\{-2, 1, 2, 6, 11\}$ Range: $\{0, 2, 4, 6\}$

4. Suppose $f(x)$ is an exponential function. If $\frac{f(12)}{f(7)} = 4$, then what is the value of $\frac{f(30)}{f(15)}$?

   $a^5 = 4$ $\boxed{a^{15} = 64}$ $(a^5)^3 = a^{15}$ $(4)^3 = 64$

5. Graph each of the following:

   a. $6x - 24y = 48$

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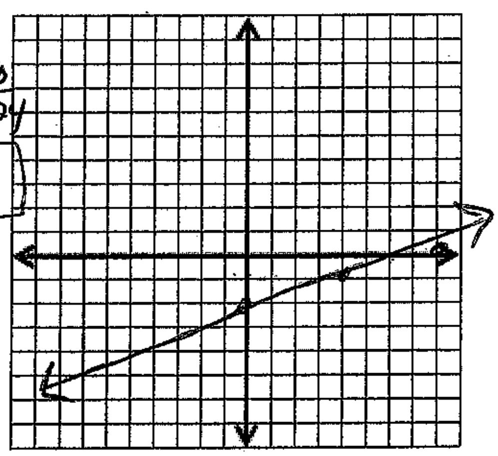
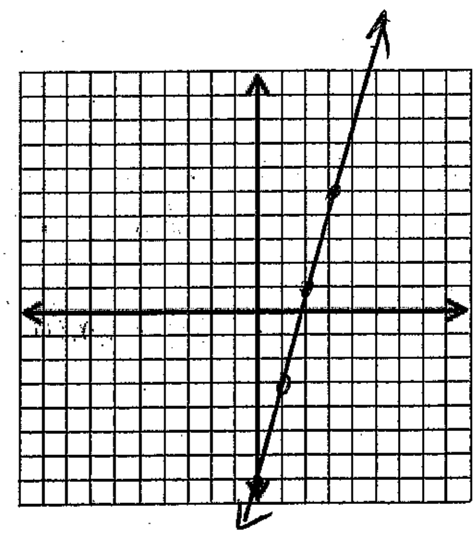
   $\frac{-24y}{-24} = \frac{-6x}{-24} \frac{+48}{-24}$

   $\boxed{y = \frac{1}{4}x - 2}$

   b. $y = 4x - 7$

6. Write an exponential function in BOTH recursive form and the form $f(x) = c \cdot a^x$ that represents each of the following:

   a. $(2, 5)$ and $(3, 125)$

x	f(x)
0	.008
1	.2
2	5
3	125

   $a = 25$

   $f(x) = (.008)(25)^x$

   $f(x+1) = 25 \cdot f(x)$

   b.

x	f(x)
2	5
3	
4	15

   0: 1.667, 2.887

   $15 = 5 \cdot a \cdot a$

   $15 = 5 \cdot a^2$

   $3 = a^2$

   $1.732 = a$

   $f(x) = (1.667)(1.732)^x$

   $f(x+1) = (1.732) f(x)$

   c. $f(x+1) = \frac{1}{2} \cdot f(x)$; $f(3) = 24$

   $f(x) = 192(\frac{1}{2})^x$

   d.

x	f(x)
2	17
3	
4	
5	99

x	f(x)
0	5.247
1	9.444
2	17

   $99 = 17a^3$

   $5.824 = a^3$

   $\sqrt[3]{5.824} = \sqrt[3]{a^3}$

   $1.8 = a$

   $f(x) = (5.247)(1.8)^x$

   $f(x+1) = (1.8) f(x)$

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7. The price of a diamond necklace is \$2350. The value of the ring appreciates at a rate of 0.26% each year. How much will the ring be worth in 25 years? After approximately how many years will the ring be worth \$4100?

$f(25) = 2507.61$ | After 214 years.

8. State whether the function represented by each table is linear or non-linear, then write an algebraic representation of each in two different forms.

a.

x	f(x)
2	12
3	24
4	48
5	96
6	192

Exponential

$f(x+1) = 2 \cdot f(x)$

$f(x) = 3(2)^x$

b.

x	f(x)
1	10
2	3
3	-4
4	-11
5	-18

Linear

$f(x+1) = f(x) + -7$

$f(x) = -7x + 17$

9. Find the slope of the line described by each set of points, graph or equation:

a. $f(x+1) = f(x) + \frac{3}{4}$ $m = 3/4$

b. passes through $(0,5)$ and $(1,8)$ $m = \frac{8-5}{1-0} = 3$

c. $y = -\frac{8}{9}x - 17$ $m = -8/9$

10. Answer all of the following questions about the graph of the following function: $f(x) = 5 \cdot 2^x$

- Is the function increasing or decreasing? Increasing
- What is the y-intercept? $(0,5)$
- What appears to be the equation of the horizontal asymptote? $y = 0$

11. A 5-minute long distance phone call costs \$4.50. A 12 minute long distance call costs \$6.60.

a. Write a linear equation in slope-intercept form to model this situation. $f(x) = .3x + 3$

b. Re-write the equation from part a in recursive form. What does "recursive" mean? $f(x+1) = .3 + f(x)$ Find the next value.

c. Following this model, to the nearest cent, how much will a 33 minute and 30 second long distance phone call cost?

$f(33.5) = .3(33.5) + 3 = \$13.05$

12. Your grandfather gave you a baseball card collection whose value increases at a fixed rate every year. You don't know how much they were worth the day he gave them to you, or what the rate is, but you know that after four years the amount was \$1550, and after seven years the amount was \$1593.45.

a. What is an algebraic representation (in the form $f(x) = c \cdot a^x$) that represents this situation? $f(x) = 1507.35(1.007)^x$

b. What is the interest rate? $100 - 100.7 = .7\%$

c. How much were the cards worth initially? \$1507.35

d. How much will they be worth 20 years after the day you received them? $f(20) = 13{,}230.15$

e. After how many years will they be worth \$1900? After 33 years.

13. Find the decay factor for an exponential function representing a 0.175% decrease in the value of the dependent variable for each consecutive value of the independent variable. $100 - .175 =$ 99.825% $\rightarrow$ (.99825)

14. Find the growth factor for an exponential function representing a 12.12% increase in the value of the dependent variable for each consecutive value of the independent variable. $100 + 12.12 = 112.12\% \rightarrow (1.1212)$

15. Suppose f is a linear function. If $f(10) - f(6) = 20$, then what is the value of $f(17) - f(9)$?

$m = \frac{20}{4} = 5$ $\boxed{8 \cdot 5 = 40}$

16. What is the y-intercept of the function represented algebraically by $f(x) = \frac{2}{3} \cdot f(x)$ when $f(1) = 6$?

0	9
1	6

$(0,9)$

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