NAME: _____ PERIOD: _____ DATE: _____

Homework Problem Set

Determine if the table in each problem can represent a linear function. Explain your thinking.

1.

x	y
0	7
2	9
4	11
6	13

+2, +2, +2 (left) +2, +2, +2 (right)

$ROC = \frac{y}{x} = \frac{2}{2} = 1$

Linear → has constant rate of change

2.

x	y
1	3
2	6
3	9
4	12

+1, +1, +1 (left) 3, 3, 3 (right)

$ROC \rightarrow \frac{y}{x} = \frac{3}{1} = 3$

Linear → has constant rate of change

3.

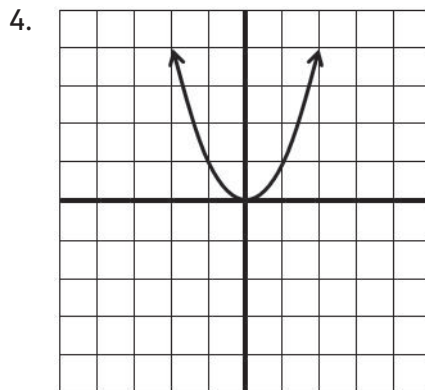| x	y
0	0
1	1
2	4
3	9

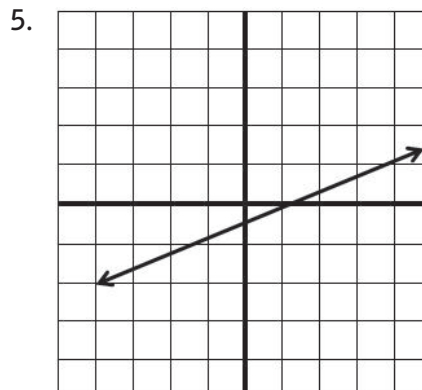1, 1, 1 (left) 1, 3, 5 (right)

$ROC \rightarrow NONE$

Nonlinear → Doesn't have a constant rate of change
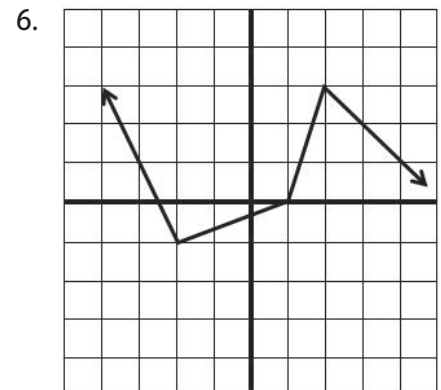
Determine if the graph in each problem is representing a linear or a nonlinear function.

4.

Non-Linear

5.

Linear

6.

Non-linear

Determine if the equation in each problem is representing a linear or a nonlinear function.

7. $f(x) = 2x - 1$

Linear

8. $f(x) = 2x^2 - 1$

Nonlinear

9. $f(x) = -3 + 4x$

Linear

Choose the Best Option

Two equipment rental companies have different penalty policies for returning a piece of equipment late.

Company 1: On day 1, the penalty is $5. On day 2, the penalty is $10. On day 3, the penalty is $15. On day 4, the penalty is $20, and so on, increasing by $5 each day the equipment is late.

Company 2: On day 1, the penalty is $0.01. On day 2, the penalty is $0.02. On day 3, the penalty is $0.04. On day 4, the penalty is $0.08, and so on, doubling in amount each additional day late.

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Jim rented a digger from Company 2 because he thought it had the better late return policy. The job he was doing with the digger took longer than he expected, but it did not concern him because the late penalty seemed so reasonable. When he returned the digger 15 days late, he was shocked by the penalty fee.

10. Why is Company 2 a more expensive option for Jim?

Company 2 doubles each day.

11. Use the table below to see the charges over the 15 late days.

Company 1	
Day	**Penalty**
1	5
2	10
3	15
4	20
5	25
6	30
7	35
8	40
9	45
10	50
11	55
12	60
13	65
14	70
15	75

Company 2	
Day	**Penalty**
1	.01
2	.02
3	.04
4	.08
5	.16
6	.32
7	.64
8	1.28
9	2.56
10	5.12
11	10.24
12	20.48
13	40.96
14	81.92
15	163.84

12. Which company has a greater 15-day late charge?

Company 2

13. Describe how the amount of the late charge changes from any given day to the next successive day in both Companies 1 and 2.

Company 1 is linear growth (+5 each day)
Company 2 is exponential growth (×2 each day)

14. A. Write a formula for the sequence that models the data in the table for Company 1.

$$f(d) = 5d$$

B. Is the sequence arithmetic, geometric, or neither? Is the formula linear, exponential or neither?

arithmetic, linear

15. A. Write a formula for the sequence that models the data in the table for Company 2.

$$g(d) = 0.01 (2)^{d-1}$$

B. Is the sequence arithmetic, geometric, or neither? Is the formula linear, exponential or neither?

geometric, exponential

16. How much would the late charge have been after 20 days under Company 1? Company 2?

Company 1
$$f(d) = 5d$$
$$f(20) = 5(20)$$
$$\boxed{f(20) = \$100}$$

Company 2
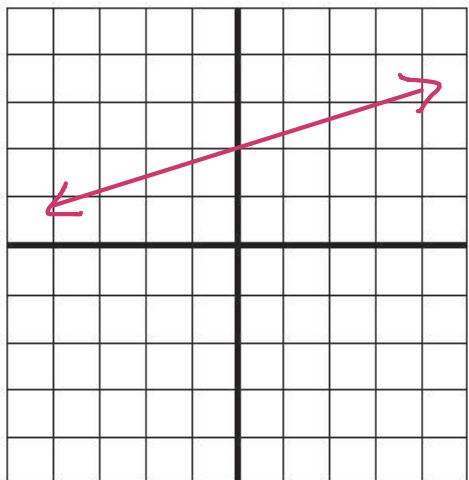$$g(d) = 0.01 \cdot 2^{d-1}$$
$$g(20) = 0.01 \cdot 2^{19}$$
$$\boxed{g(20) = \$5242.88}$$

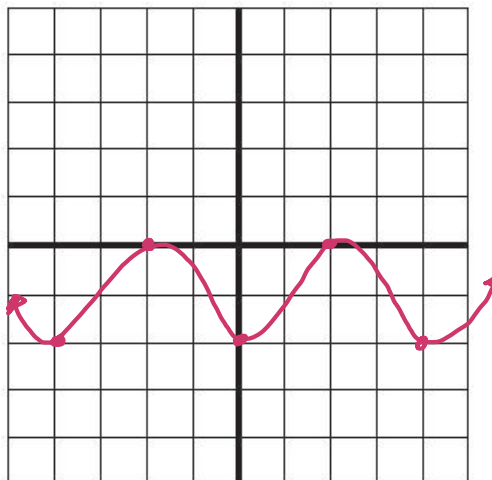17. Which of the two penalties grows more quickly? Why?

Company 2 penalties grow gradually at beginning & then rapidly increase after day 10.

This is because you are multiplying instead of adding.

18. Sketch a graph of a linear function.

19. Sketch a graph of a nonlinear function.

Spiral REVIEW—Evaluating Functions

Determine the value of $f(2)$ and $f(-2)$ for each equation below.

20. $f(x) = 2x - 1$

$f(2) = 3$

$f(-2) = -5$

21. $f(x) = 2x^2 - 1$

$f(2) = 7$

$f(-2) = 7$

22. $f(x) = -3 + 4x$

$f(2) = 5$

$f(-2) = -11$

23. $f(x) = |2x - 1|$

$f(2) = 3$

$f(-2) = 5$

24. $f(x) = |2x^2 - 1|$

$f(2) = 7$

$f(-2) = 7$

25. $f(x) = |-3 + 4x|$

$f(2) = 5$

$f(-2) = 11$

26. $f(x) = |2x| - 1$

$f(2) = 3$

$f(-2) = 3$

27. $f(x) = |2x^2| - 1$

$f(2) = 7$

$f(-2) = 7$

28. $f(x) = -3 + |4x|$

$f(2) = 5$

$f(-2) = 5$