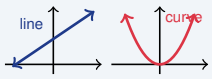
Linear and Nonlinear Functions

Name: _____	Date: _____	Score: _____ / 18

Quick Review and Helpful Hints

A *linear* function has a constant rate of change and graphs as a straight line; its equation looks like $y = mx + b$ (the variable is only to the first power). A *nonlinear* function (like $y = x^2$ or $y = \frac{1}{x}$) curves and changes its rate.

▷ **Example:** Is $y = 3x - 2$ linear or nonlinear? **Work:** The variable x is to the first power and the form is $y = mx + b$, so the graph is a straight line. ★ **Answer:** Linear



Linear = line; nonlinear = curve.

Practice Problems

Tell whether each function is Linear or Nonlinear.

1. $y = 2x + 1$ _____

2. $y = x^2$ _____

3. $y = -4x$ _____

4. $y = x^3 + 1$ _____

5. $y = 5$ _____

6. $y = \frac{1}{x}$ _____

7. $y = \frac{1}{2}x - 3$ _____

8. $y = 2^x$ _____

9. $y = 7 - x$ _____

10. $y = \sqrt{x}$ _____

11. Table y: $2, 4, 6, 8$ (equal steps) _____

12. Table y: $1, 4, 9, 16$ _____

13. $y = x^2 - 2x$ _____

14. $y = -x + 6$ _____

Word Problems

15. A car travels at a constant 60 mph. Is distance vs. time linear or nonlinear? _____

16. A population doubles every year. Is that growth linear or nonlinear? _____

17. A function in the form $y = mx + b$ always graphs as what kind of shape? _____

18. The graph of $y = x^2$ is a curve. What is that curve called? _____

Answer Keys

1. Linear	**7.** Linear	**13.** Nonlinear
2. Nonlinear	**8.** Nonlinear	**14.** Linear
3. Linear	**9.** Linear	**15.** Linear
4. Nonlinear	**10.** Nonlinear	**16.** Nonlinear
5. Linear	**11.** Linear	**17.** straight line
6. Nonlinear	**12.** Nonlinear	**18.** parabola

Step-by-Step Explanations

1. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Form $y = mx + b$, first power: linear. So the final answer is Linear.

2. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is squared: nonlinear. So the final answer is Nonlinear.

3. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = -4x$ fits $y = mx + b$: linear. So the final answer is Linear.

4. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is cubed: nonlinear. So the final answer is Nonlinear.

5. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A constant gives a flat line: linear. So the final answer is Linear.

6. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is in the denominator: nonlinear. So the final answer is Nonlinear.

7. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is First power, $y = mx + b$ form: linear. So the final answer is Linear.

8. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is x is an exponent: nonlinear. So the final answer is Nonlinear.

9. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = 7 - x$ is $y = -x + 7$: linear. So the final answer is Linear.

10. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is A square root curves: nonlinear. So the final answer is Nonlinear.

11. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Equal steps mean a constant rate: linear. So the final answer is Linear.

12. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Differences $3, 5, 7$ change: nonlinear. So the final answer is Nonlinear.

13. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Contains x^2: nonlinear. So the final answer is Nonlinear.

14. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Fits $y = mx + b$: linear. So the final answer is Linear.

15. Step by step: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Constant speed gives a straight line: linear. So the final answer is Linear.

16. Take it one move at a time: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is Doubling is exponential: nonlinear. So the final answer is Nonlinear.

17. Start by naming the process: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = mx + b$ graphs as a straight line. So the final answer is straight line.

18. A good way to think about this is: Read what the problem is asking, choose the matching rule, write the setup, and then simplify one step at a time. The setup/work is $y = x^2$ graphs as a parabola. So the final answer is parabola.

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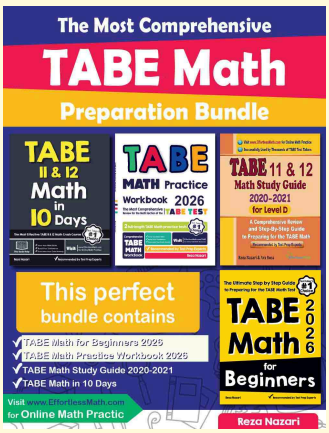

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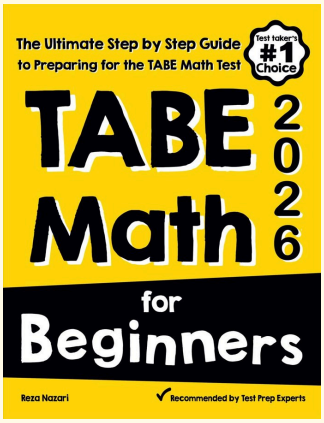

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