

Warm Up

February 11, 2019

1.) Identify the y-intercept of the following functions:

A. $3x - 2y = 8$

B. $y = 2(1.08)^x - 4$

2.) Identify whether the table below is linear or exponential, then write the appropriate function.

x	0	1	2	3	4	5	6	7
y	12	8	4	0	-4	-8	-12	-16

Linear or exponential? $y =$ _____

Linear vs. Exponential Scenarios

- If the growth or decay involves **increasing or decreasing** by a fixed number, use a **linear** function. The equation will look like:

$$y = mx + b$$

$$f(x) = (\text{rate})x + (\text{starting amount}).$$

- If the growth or decay is expressed using **multiplication** (including words like “doubling” or “halving”) use an **exponential** function. The equation will look like:

$$f(x) = (\text{starting amount}) \cdot (\text{base})^x.$$

Ex. 1) A library has **8000**^b books, and is **adding** **500**^m more books each year.

Linear or Exponential

$$y = \underline{500x + 8000}$$

Ex. 2) A gym's customers must pay $\$50^b$ for a membership, plus $\$3$ for each time they use the gym.

Linear or Exponential

$$y = 3x + 50$$

Ex. 3) A bank account starts with \$10. Every month, the amount of money in the account triples.

mult. by 3!

Linear or Exponential

$$y = 10(3)^x$$

Ex. 4) At the start of a carnival, you have 50^b ride tickets. Each time you ride the roller coaster, you have to pay 6 tickets.

$$m = -6$$

Linear or Exponential

$$y = -6x + 50$$

Ex. 5) There are 20,000 owls in the wild. Every decade, the number of owls is halved. $r = \frac{1}{2}$

Linear or Exponential

$$y = 20,000 \left(\frac{1}{2}\right)^x$$

x	y
0	20,000
10	10,000
20	5,000
30	2,500

Practice: The function $f(t) = 45(1.2)^t$ gives the approximate number of fish in a large pond after t years.

Select all of the true statements.

exponential

- A. There were originally 45 fish in the pond. $a=45$
- B. There were originally 54 fish in the pond.
- C. The number of fish increases by 9 every year.
- D. The number of fish doubles every year.
- E. The number of fish increases by a factor of 1.2 every year.

Identify whether each scenario models a linear or exponential function. or -

A. A taxi charges an initial fee of \$2.00, and \$1.50 for each additional mile. linear

B. The population in a town decreases by 15% each year.
exponential

C. An airplane flying at an altitude of 33,000 feet descends at a rate 20 feet per minute. linear

D. A pizza restaurant charges \$5.50 per pizza, and \$0.50 for each additional topping. linear

E. A cell doubles in size every 2 hours.
exponential

smaller

The amount of carbon 14 decays in an exponential fashion. Which table could show the approximate amount of carbon 14 over the 5-year interval shown?

Year	Amount of Carbon 14 (in grams)
1	19.800
2	19.602
3	19.406
4	19.212
5	19.020

Year	Amount of Carbon 14 (in grams)
1	20.200
2	20.402
3	20.606
4	20.812
5	21.020

getting larger

Year	Amount of Carbon 14 (in grams)
1	19
2	18
3	17
4	16
5	15

linear

Year	Amount of Carbon 14 (in grams)
1	21
2	22
3	23
4	24
5	25

linear

1, 2, 3, 4, ...

For which positive integer value of x will the value of $f(x) = 5(1.25)^x$ first exceed the value of $g(x) = 12x + 25$? **EXP.** $>$

linear

x	$f(x)$	$g(x)$
1	6.25	37
2	7.81	49
3	9.77	61
4	12.2	73
5	15.3	85
6	19.0	97

$x = 18$

Clara and Michelle's parents started saving for college in 1998.

- Clara's college fund can be modeled by the function $f(x) = 500x + 2500$
- Michelle's college fund can be modeled by the function $f(x) = 2500(1.1)^x$, where x is the number of years since 1998.

About what year will Michelle's college fund first exceed Clara's college fund?

$$y_1 = 2500(1.1)^x > y_2 = 500x + 2500$$

$$x = 15 \text{ is when } y_1 > y_2$$
$$1998 + 15 = 2013$$