

1. What is the smallest, positive integer value of  $x$  such that the value of

$f(x) = 2^x + 3$  exceeds the value of  $g(x) = 50x + 5$ ?

- A. 8  
B. 9  
C. 10  
D. 11

$$f(x) > g(x)$$

$$f(8) = 2^8 + 3 = 259$$

$$g(8) = 50(8) + 5 = 405$$

$$f(9) = 2^9 + 3 = 515$$

$$g(9) = 50(9) + 5 = 455$$

$$\text{opt \#1: } 750x + 32500$$

$$\text{opt \#2: } 32500(1.02)^x$$

2. Martha currently earns \$32,500 each year. She has been offered two different options for a pay raise.

- The first option is a \$750 increase in salary at the start of each year.
- The second option is a 2% increase in salary at the start of each year.

Which statement is true?

- A. The first option will always result in a higher salary for Martha.
- B. The second option will result in a higher salary at the start of the 2<sup>nd</sup> year.
- ☒ C. The second option will result in a higher salary at the start of the 16<sup>th</sup> year.
- D. There is no difference in the two salaries since \$750 is approximately 2% of her salary.

3. Jason and Ann invested money.

- Jason invested \$1,400 into an account that pays 20% interest compounded annually.
- Ann invested \$1,400 into an account that earns \$30 in interest each month.

**About** how long will it take before Jason's investment has a higher value than Ann's investment?

- A. 12 months      C. 36 months  
B. 30 months      D. 43 months

Jason

$$y = 1400(1.2)^x$$

$x = \text{years}$

	x	y
	0	1400
12m	1	1680
24m	2	2016
36m	3	2419.2
48m	4	2903

4. Brandon deposited \$250 into a checking account that does not earn interest. Each month he withdrew \$10 and then deposited \$45 into the account. Which type of function **best** models the amount of money that Brandon has in his account after  $x$  months?

- A. ~~Exponential function with a growth rate of \$55 per month~~  
B. ~~Exponential function with a growth rate of \$35 per month~~  
C. Linear function with a rate of change of \$55 each month  
D. Linear functions with a rate of change of \$35 each month

$$30x + 1400$$

x	y
0	1400
12	1760
24	2120
36	2480
48	2840

5. 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.

- ☒ A. There were originally 45 fish in the pond.
- ☐ 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.

6. Juan started working at Tellurine Industries in 2004. He has earned the same percentage increase in salary each year. He was paid \$51,550 in 2008 and \$60,128 in 2010. By what percent did Juan's salary increase each year? Round your answer to the nearest whole percent.

8%

$$y = a(1+r)^t$$

$$\frac{60128}{51550} = \frac{51550(1+r)^2}{51550}$$

$$\sqrt{1.17} = \sqrt{(1+r)^2}$$

$$1.08 = 1+r$$

$$.08 = r$$

7. 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

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

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

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

$$f(x) > g(x)$$

9. Two functions are shown in the table below.

$x$	$f(x)$	$g(x)$
-3	1	8
-2	4	4
-1	7	2
0	10	1

Which statement is true about the two functions when  $x = -6$ ?

- A. The value of  $f(x)$  exceeds the value of  $g(x)$  by 56.
- B. The value of  $g(x)$  exceeds the value of  $f(x)$  by 56.
- C. The value of  $f(x)$  exceeds the value of  $g(x)$  by 72.
- D. The value of  $g(x)$  exceeds the value of  $f(x)$  by 72.

10. Two functions are listed below.

$$f(x) = 200 + 50x$$
$$g(x) = 50(1.5)^x$$

- A. The value of  $f(x)$  exceeds the value of  $g(x)$  by 50.
- B. The value of  $g(x)$  exceeds the value of  $f(x)$  by 50.
- C. The value of  $f(x)$  exceeds the value of  $g(x)$  by 2200.
- D. The value of  $g(x)$  exceeds the value of  $f(x)$  by 2200.