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x	$f(x)$	$g(x)$
-2	3	4
-1	5	2
0	-2	-3
1	3	5
2	6	7
3	7	1

For the functions f and g , the table gives six values of x and their corresponding values of $f(x)$ and $g(x)$. If $g(c) = 5$, where c is a constant, what is the value of $f(c)$?

- A) -2
 B) 3
 C) 5
 D) 6

7

$$f(x) = -x(x-a)(x+a)(x+b)(x+b)$$

In the given function f , a and b are positive constants and $a \neq b$. For how many distinct values of x does $f(x) = 0$?

- A) Two
 B) Three
 C) Four
 D) Five

8

In the xy -plane, the graph of $y = f(x)$ reaches its maximum value at the point $(3, f(3))$. The function g is defined by $g(x) = f(x) + 7$. At which of the following points in the xy -plane does the graph of $y = g(x)$ reach its maximum value?

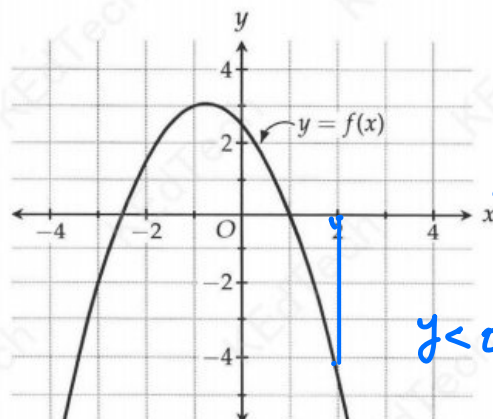
- A) $(10, f(10) + 7)$
 B) $(f(3), f(3) + 7)$
 C) $(3, f(10))$
 D) $(3, f(3) + 7)$

$$f(x) \xrightarrow{\text{max}} (3, f(3))$$

$$g(x) = f(x) + 7 \quad \underline{f(3) + 7}$$

$$(3, f(3) + 7)$$

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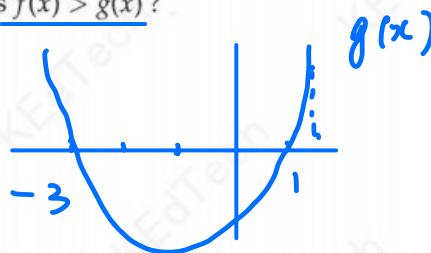
$$x = 0$$

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

$$y < 0$$

The graph of $y = f(x)$ is shown in the xy -plane. If the function g is defined by $g(x) = (x+3)(x-1)$, for which of the following values of x is $f(x) > g(x)$?

- A) -3
 B) -2
 C) 1
 D) 2



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x	$f(x)$
-4	3
-2	5
0	2
2	16
3	4
4	8

For the function f , the table shows several values of x and their corresponding values of $f(x)$. Function g is defined by $g(x) = 2f(x)$. What is the value of k if $g(k) = 8$?

- A) 2
 B) 3
 C) 4
 D) 8

11

The function f is defined by

$$f(x) = \frac{(x+3)(12-x)}{x}. \text{ The value of } f(a-9) \text{ is } 0,$$

where a is a constant. What is the greatest possible value of a ?

$$\begin{aligned} x = -3 & \quad a - 9 = -3 \quad a = 6 \\ x = 12 & \quad a - 9 = 12 \quad a = 21 \end{aligned}$$

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Function g is defined by $g(x) = \frac{x-8}{2}$. The graph of $y = g(x)$ in the xy -plane passes through the points $(20, c)$ and (c, d) , where c and d are constants. What is the value of d ?

- A) -5
- ☒ B) -1
- C) 3
- D) 6

13

The graph of $y = f(x)$ has a y -intercept at $(0, 12)$ and x -intercepts at $(-3, 0)$ and $(2, 0)$. Which of the following equations could define f ?

- A) $f(x) = (x+3)^2(x-2)$
- ☒ B) $f(x) = (x+3)(x-2)^2$
- C) $f(x) = (x-3)^2(x+2)$
- D) $f(x) = (x-3)(x+2)^2$

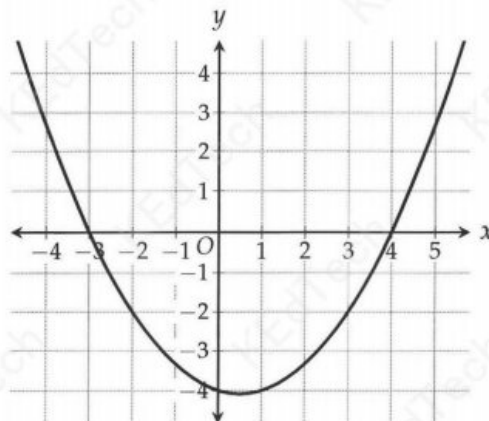
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$$f(x) = \sqrt{x-2}$$

The function f is defined by the given equation. Which of the following is equal to $f(18) - f(11)$?

- ☒ A) $f(3)$
- B) $f(5)$
- C) $f(6)$
- D) $f(7)$

15



An equation for the graph shown is $y = a(x+3)(x+b)$, where a and b are constants. What is the value of ab ?

- A) -2
- ☒ B) $-\frac{4}{3}$
- C) $\frac{1}{2}$
- D) 8

16

The function f is defined by $f(x) = \frac{11}{3}x + 34$,

and the function g is defined by $g(x) = \frac{5}{3}x - 8$. If

the function h is defined by $h(x) = f(x) - g(x)$, what is the x -coordinate of the x -intercept of the graph of $y = h(x)$ in the xy -plane?

$$-21$$

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The function f is defined by $f(x) = 125 \cdot a^x - b$, where a and b are constants. In the xy -plane, the graph of $y = f(x)$ has an x -intercept at $(3, 0)$ and a y -intercept at $(0, b - 3)$. What is the value of b ?

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18

The function f is defined by $f(x) = \frac{x+32}{x+b}$, where b is a constant. If $f(-8) = 4$, what is the value of $f(10)$?

 $\frac{7}{4}$

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The function f is defined by $f(x) = 7(4)^{-x} + 13$. Which of the following statements must be true?

- I. $f(x) > 7$
 II. $f(x) \leq 20$

- (A) I only
 (B) II only
 (C) Neither I nor II
 (D) I and II

$$a = 16 \text{ or } b = -7$$

$$x = 9$$

$$f(x) = \sqrt{a-9} (b+7) > 0$$

$$\sqrt{a-9} > 0 \quad b+7 > 0$$

$$a > 9$$

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The function f is defined by $f(x) = b \cdot a^x$, where a and b are positive constants, and $g(x) = f(x+2)$. The graph of $y = f(x)$ in the xy -plane passes through the points $(0, 36)$ and $(-3, \frac{9}{16})$. Which equation defines the function g ?

- (A) $g(x) = 216 \cdot 3^x$
 (B) $g(x) = 324 \cdot 3^x$
 (C) $g(x) = 288 \cdot 4^x$
 (D) $g(x) = 576 \cdot 4^x$

21

Function f is defined by $f(x) = a\sqrt{x} + b$, where a and b are constants. In the xy -plane, the graph of $y = f(x)$ has an x -intercept at $(16, 0)$, and the graph of $y = f(x) - 10$ has an x -intercept at $(9, 0)$. What is the value of b ?

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$$f(x) = b\sqrt{a-x} + 7\sqrt{a-x}$$

For the function f , a and b are constants and $f(16) = 0$. If $f(9) > 0$, which of the following could be the value of $a + b$?

- (A) -3
 (B) 7
 (C) 9

$$(D) 15 \quad x = 16 \quad f(x) = b\sqrt{a-x} + 7\sqrt{a-x}$$

$$= \sqrt{a-x} (b+7)$$

$$= \sqrt{a-16} (b+7) = 0$$

$$b > -7$$

$$a = 16$$

$$b > -7 \quad a+b$$