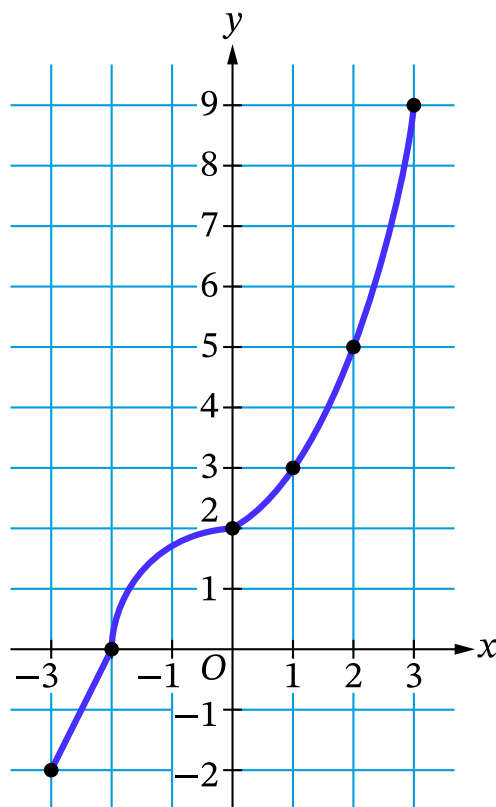


1. The figure shows the graph of the increasing function  $f$  on its domain of  $-3 \leq x \leq 3$ .



Graph of  $f$

The function  $g$  is given by  $g(x) = -4.792 + \ln(6x - 6)$ .

A.

- The function  $h$  is defined by  $h(x) = (g \circ f)(x) = g(f(x))$ . Find the value of  $h(2)$  as a decimal approximation, or indicate that it is not defined. Show the work that leads to your answer.
- Find all values of  $x$  for which  $f(x) = 3$ , or indicate that there are no such values.

B.

- Find all values of  $x$ , as decimal approximations, for which  $g(x) = -1.5$ , or indicate that there are no such values.
- Determine the behavior of  $g$  as  $x$ -values decrease and get arbitrarily close to 1. Express your answer using the mathematical notation of a limit.

C.

- Is the function  $f$  invertible?
- Give a reason for your answer in part C (i) based on properties of the function  $f$ . Refer to points on the graph of  $f$  in your reasoning.

1. The function  $f$  is decreasing and is defined for all real numbers. The table gives values for  $f(x)$  at selected values of  $x$ .

|        |    |    |     |      |       |
|--------|----|----|-----|------|-------|
| $x$    | -2 | -1 | 0   | 1    | 2     |
| $f(x)$ | 14 | 7  | 3.5 | 1.75 | 0.875 |

The function  $g$  is given by  $g(x) = -0.167x^3 + x^2 - 1.834$ .

A.

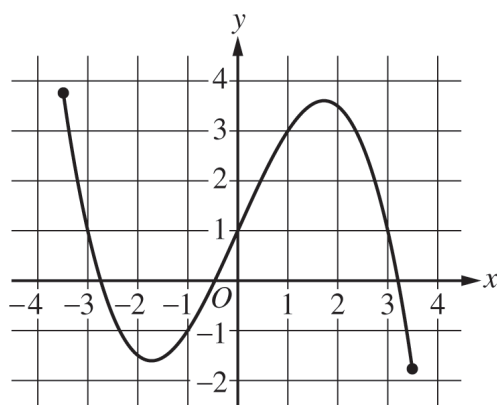
- The function  $h$  is defined by  $h(x) = (g \circ f)(x) = g(f(x))$ . Find the value of  $h(1)$  as a decimal approximation, or indicate that it is not defined. Show the work that leads to your answer.
- Find the value of  $f^{-1}(3.5)$ , or indicate that it is not defined.

B.

- Find all values of  $x$ , as decimal approximations, for which  $g(x) = 0$ , or indicate that there are no such values.
- Determine the end behavior of  $g$  as  $x$  increases without bound. Express your answer using the mathematical notation of a limit.

C.

- Based on the table, which of the following function types best models function  $f$ : linear, quadratic, exponential, or logarithmic?
- Give a reason for your answer in part C (i) based on the relationship between the change in the output values of  $f$  and the change in the input values of  $f$ . Refer to the values in the table in your reasoning.

Graph of  $f$ 

1. The figure shows the graph of the function  $f$  on its domain of  $-3.5 \leq x \leq 3.5$ . The points  $(-3, 1)$ ,  $(0, 1)$ , and  $(3, 1)$  are on the graph of  $f$ . The function  $g$  is given by  $g(x) = 2.916 \cdot (0.7)^x$ .
- (A) (i) The function  $h$  is defined by  $h(x) = (g \circ f)(x) = g(f(x))$ . Find the value of  $h(3)$  as a decimal approximation, or indicate that it is not defined.
- (ii) Find all values of  $x$  for which  $f(x) = 1$ , or indicate that there are no such values.
- (B) (i) Find all values of  $x$ , as decimal approximations, for which  $g(x) = 2$ , or indicate that there are no such values.
- (ii) Determine the end behavior of  $g$  as  $x$  increases without bound. Express your answer using the mathematical notation of a limit.
- (C) (i) Determine if  $f$  has an inverse function.
- (ii) Give a reason for your answer based on the definition of a function and the graph of  $y = f(x)$ .

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**Write your responses to this question only on the designated pages in the separate Free Response booklet. Write your solution to each part in the space provided for that part.**