

Topic: Decomposing composite functions

Question: Write $f(x)$ as the composite of two functions $g(x)$ and $h(x)$, such that $f(x) = h(g(x))$.

$$f(x) = \sqrt{\frac{1}{x^3}}$$

Answer choices:

- A $g(x) = \frac{1}{x^3}$ and $h(x) = \sqrt{x}$
- B $g(x) = x^3$ and $h(x) = \sqrt{x}$
- C $g(x) = \frac{1}{x}$ and $h(x) = x^3$
- D $g(x) = \sqrt{x}$ and $h(x) = \sqrt{x^3}$



Solution: A

We're looking for two functions, $g(x)$ and $h(x)$, such that $f(x) = h(g(x))$.

If we notice that $1/x^3$ is inside the square root, then we could decompose the function as

$$g(x) = \frac{1}{x^3} \text{ and } h(x) = \sqrt{x}$$



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Question: Write $f(x)$ as the composite of two functions $g(x)$ and $h(x)$, such that $f(x) = h(g(x))$.

$$f(x) = \frac{x + 1}{(x + 1)^2 - 5}$$

Answer choices:

A $g(x) = x + 1$ and $h(x) = \frac{x}{x^2 - 5}$

B $g(x) = x + 1$ and $h(x) = \frac{1}{x - 5}$

C $g(x) = x + 1$ and $h(x) = \frac{x}{x - 5}$

D $g(x) = x - 1$ and $h(x) = \frac{x}{x - 5}$



Solution: A

We're looking for two functions, $g(x)$ and $h(x)$, such that $f(x) = h(g(x))$.

If we notice that $x + 1$ appears in both the numerator and denominator of f , then we could decompose the function as

$$g(x) = x + 1 \text{ and } h(x) = \frac{x}{x^2 - 5}$$



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Question: Write $f(x)$ as the composite of two functions $g(x)$ and $h(x)$, such that $f(x) = h(g(x))$.

$$f(x) = e^{x^2-5}$$

Answer choices:

- A $g(x) = e^x$ and $h(x) = x^2 - 5$
- B $g(x) = x^2 - 5$ and $h(x) = e^x$
- C $g(x) = x - 5$ and $h(x) = e^{x^2}$
- D $g(x) = e^{x-5}$ and $h(x) = x^2$



Solution: B

We're looking for two functions, $g(x)$ and $h(x)$, such that $f(x) = h(g(x))$.

If we notice that $x^2 - 5$ is the exponent of the exponential, then we could decompose the function as

$$g(x) = x^2 - 5 \text{ and } h(x) = e^x$$

