AP Precalc

Write your questions and thoughts here!

# 2.10 Inverses of Exponential Functions

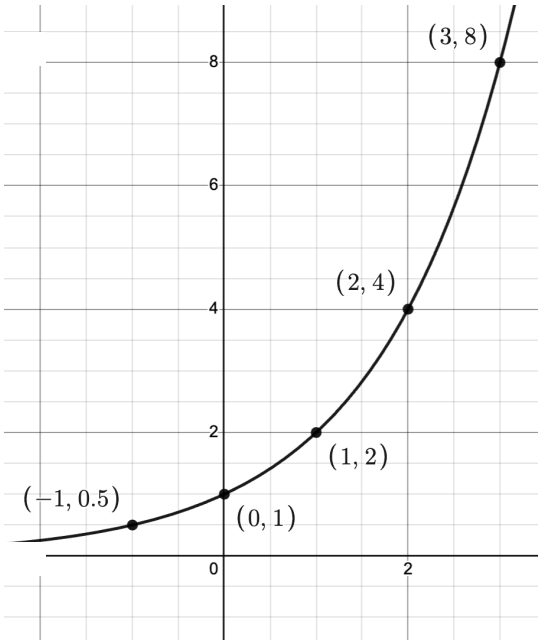
**2.10 Notes**

Exponential $f(x) = 2^x$

| $x$ | $f(x)$ |
|---|---|
| | |
| | |
| | |
| | |
| | |

Logarithmic $g(x) = \log_2 x$

| $x$ | $f(x)$ |
|---|---|
| | |
| | |
| | |
| | |
| | |




**BIG IDEA**

- The graphs are a reflection across the function
- The domain of the exponential function is the range of the logarithmic function.
- The range of the exponential function is the domain of the logarithmic function.
- The operations undo each other (like multiplication and division)
- $f(g(x)) = g(f(x)) = x$

Describe the function $f(x)$ as exponential or logarithmic and then find points for its inverse, $g(x)$.

Ex 1:

| $x$ | $f(x)$ |
|---|---|
| $-1$ | $\frac{1}{3}$ |
| 0 | 1 |
| 1 | 3 |
| 2 | 9 |
| 3 | 27 |

| $x$ | $g(x)$ |
|---|---|
| | |
| | |
| | |
| | |
| | |

Ex 2:

| $x$ | $f(x)$ |
|---|---|
| $\frac{1}{4}$ | $-1$ |
| 1 | 0 |
| 4 | 1 |
| 16 | 2 |
| 64 | 3 |

| $x$ | $g(x)$ |
|---|---|
| | |
| | |
| | |
| | |
| | |

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INVERSES UNDO EACH OTHER

$\mathbf{2^x}$ $\mathbf{\log_2 x}$

Are the following functions inverses of each other?

$f(x) = 2^x$ $g(x) = \log_2 x$

In other words, does $f\big(g(x)\big) = g\big(f(x)\big) = x$?

Find the inverse of each of the following.

Ex 3: $f(x) = 3\log_5 x$

Ex 4: $f(x) = 10^{\frac{x}{6}}$

Try these:

1. Determine if $f(x)$ and $g(x)$ are inverses.
   $f(x) = 5^{4x}$ and $g(x) = 4\log_5 x$
2. Find the inverse of $f(x) = 10\log_2 x$.

## 2.10 Inverses of Exponential Functions

AP Precalculus

## 2.10 Practice

**Describe the function $f(x)$ as exponential, logarithmic, or neither and how you know why it is that function. Then find points for its inverse $g(x)$.**

1.

| $x$ | $f(x)$ |
|---|---|
| 3 | 8 |
| 4 | 16 |
| 5 | 32 |
| 6 | 64 |

| $x$ | $g(x)$ |
|---|---|
| | |
| | |
| | |
| | |

2.

| $x$ | $f(x)$ |
|---|---|
| $\frac{1}{9}$ | $-2$ |
| $\frac{1}{3}$ | $-1$ |
| 1 | 0 |
| 3 | 1 |

| $x$ | $g(x)$ |
|---|---|
| | |
| | |
| | |
| | |

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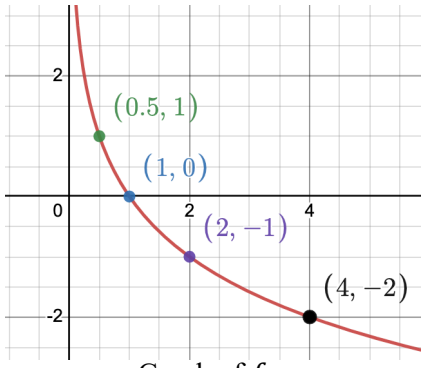
3.

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

| $x$ | $g(x)$ |
|---|---|
| | |
| | |
| | |
| | |

4.



Graph of $f$

| $x$ | $g(x)$ |
|---|---|
| | |
| | |
| | |
| | |

**Determine if $f(x)$ and $g(x)$ are inverses.**

5. $f(x) = 2\log_2 x$ and $g(x) = 2^{2x}$

6. $f(x) = 10^{0.25x}$ and $g(x) = 4\log x$

7. $f(x) = 5^{\frac{x}{8}}$ and $g(x) = 8\log_5 x$

**Find the inverse of the given function.**

8. $h(x) = 4^{5x}$

9. $m(x) = 5\log_2 x$

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**Find the inverse of the given function.**

10. $a(x) = \frac{1}{4}\log_8 x$

11. $b(x) = 10^{\frac{3}{4}x}$

## 2.10 Inverses of Exponential Functions

**2.10 Test Prep**

12. Which of the following represents a possible function that is the inverse of $f(x) = 0.25^x$?

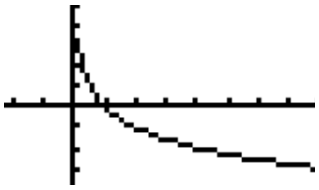
(A)

| $x$ | $f(x)$ |
|---|---|
| $-3$ | 64 |
| $-2$ | 16 |
| $-1$ | 4 |
| 0 | 1 |

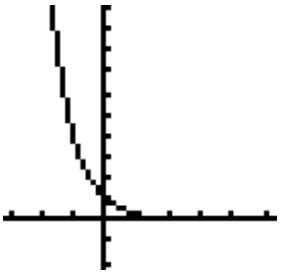
(B)

| $x$ | $f(x)$ |
|---|---|
| 4 | $-1$ |
| 1 | 0 |
| $\frac{1}{4}$ | 1 |
| $\frac{1}{16}$ | 2 |

(C)



(D)



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