

1. Solve each equation:

a. $3^{2x+1} = 9^{2x-3}$

$$3^{2x+1} = 3^{2(2x-3)}$$

$$2x+1 = 4x-6$$

$$-2x = -5$$

$$x = \frac{5}{2}$$

b. $\frac{1}{4}^{-x-4} = 64^{x+1}$

$$4^{-1(-x-4)} = 4^{3(x+1)}$$

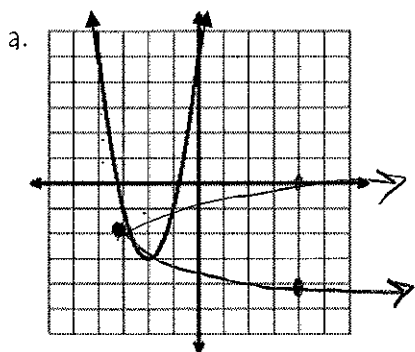
$$x+4 = 3x+3$$

$$-2x+4 = 3$$

$$-2x = -1$$

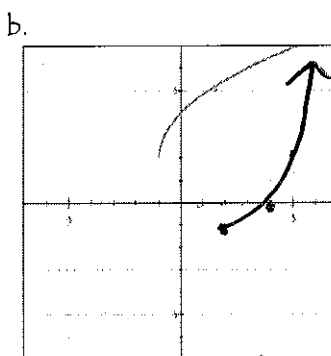
$$x = \frac{1}{2}$$

2. Sketch the inverse. Find the domain and range of the given function and the inverse.



Function
D: \mathbb{R}
R: $[3, \infty)$

Inverse
D: $[3, \infty)$
R: \mathbb{R}



Function
D: $[1, \infty)$
R: $[2, \infty)$

Inverse
D: $[2, \infty)$
R: $[1, \infty)$

$(-2, -3)$ $(-4, 1)$ $(0, 1)$
 $(-3, -2)$ $(4, -4)$ $(4, 0)$ ← inverse

original: $(-1, 2)$ $(0, 4)$ $(2, 5)$
inverse: $(2, 1)$ $(4, 0)$ $(5, 2)$

3. Find the inverse of each function, showing algebraic steps

a. $y = \sqrt[3]{x-2} + 5$

$$x = \sqrt[3]{y-2} + 5$$

$$(x-5)^3 = (\sqrt[3]{y-2})^3$$

$$(x-5)^3 = y-2$$

$$y = (x-5)^3 + 2$$

b. $y = (3x-2)^3 - 9$

$$x = \frac{(3y+9)^3 - 9}{3}$$

$$\sqrt[3]{x+9} = \sqrt[3]{(3y-2)^3}$$

$$\sqrt[3]{x+9} = 3y-2$$

$$\frac{\sqrt[3]{x+9} + 2}{3} = \frac{3y}{3}$$

$$y = \frac{\sqrt[3]{x+9} + 2}{3}$$

c. $y = \frac{3}{x-1}$

$$x(y-1) = \frac{3}{y-1} \cdot (y-1)$$

$$\frac{x(y-1)}{x} = \frac{3}{x}$$

$$y-1 = \frac{3}{x}$$

$$y = \frac{3}{x} + 1$$

4. Verify that the following functions are (or are not) inverses using composition of functions.

$f(x) = x^2 + 2, x \geq 0$
 $g(x) = \sqrt{x-2}$

$f(g(x)) =$
 $f(\sqrt{x-2}) = (\sqrt{x-2})^2 + 2$
 $= x-2 + 2$
 $= x \checkmark$

* Must prove $f(g(x)) = x$ & $g(f(x)) = x$

$g(f(x)) = \sqrt{x^2+2} - 2$
 $= \sqrt{x^2}$
 $= x \checkmark$

Yes, they are inverses of each other

5. Find the following function compositions using the given functions:

| | | | |
|-----------------|------------------|----------------|------------------------|
| $f(x) = 4x - 3$ | $g(x) = x^2 + 7$ | $h(x) = x + 2$ | $m(x) = x^2 + 7x + 10$ |
|-----------------|------------------|----------------|------------------------|

a. $(f \circ g)(x)$
 $f(x^2 + 7) = 4(x^2 + 7) - 3$
 $= 4x^2 + 28 - 3$
 $= \boxed{4x^2 + 25}$

b. $m(h(x))$
 $m(x+2) = (x+2)^2 + 7(x+2) + 10$
 $x^2 + 4x + 4 + 7x + 14 + 10$
 $= \boxed{x^2 + 11x + 28}$

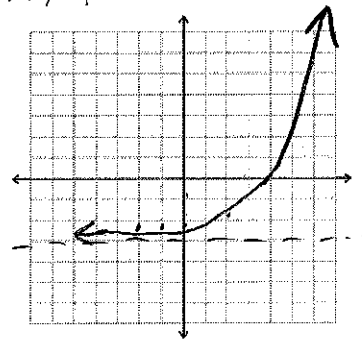
c. $g(f(2))$
 $f(2) = 4(2) - 3 = 5$
 $g(5) = 5^2 + 7 = 25 + 7 = \boxed{32}$

d. $(h \circ m)(1)$
 $m(1) = 1 + 7 + 10 = 18$
 $h(18) = 18 + 2 = \boxed{20}$

6. Graph $f(x) = 2^{x-2} - 3$. List the intercepts, domain, range and asymptote

| X | y |
|----|-------|
| -2 | -2.9 |
| -1 | -2.89 |
| 0 | -2.75 |
| 1 | -2.5 |
| 2 | -2 |

x-inter: (3.58, 0)
 y-inter: (0, -2.75)
 domain: $\mathbb{R} (-\infty, \infty)$
 Range: $(-3, \infty)$
 Asymp: $y = -3$



7. Graph the inverse of $f(x) = 3^x + 1$. List the intercepts, domain, range and asymptote

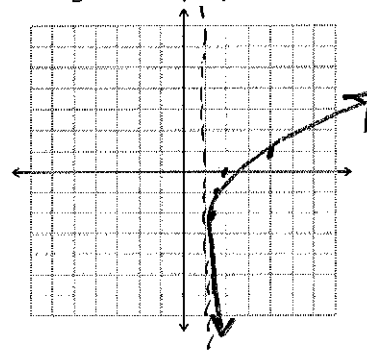
$y = 3^x + 1$

| X | y |
|----|------|
| -2 | 1.11 |
| -1 | 1.33 |
| 0 | 2 |
| 1 | 4 |
| 2 | 10 |

inverse

| X | y |
|------|----|
| 1.11 | -2 |
| 1.33 | -1 |
| 2 | 0 |
| 4 | 1 |
| 10 | 2 |

x-inter: (2, 0)
 y-inter: none
 Domain: $(1, \infty)$
 range: \mathbb{R}
 asypt: $x = 1$



8. Write the following in logarithmic form

a. $10^3 = 1000$
 $\log_{10} 1000 = 3$

b. $\frac{1}{2}^{-3} = 8$
 $\log_{\frac{1}{2}} 8 = -3$

9. Write the following in exponential form

a. $\log_5 125 = 3$
 $5^3 = 125$

b. $\log_3 81 = 4$
 $3^4 = 81$

10. Solve the following for x.

a. $10^{2x-1} = 10^{x+7}$

$$2x-1 = x+7$$

$$\boxed{x=8}$$

b. $4^{2x+2} = 32^{x-5}$

$$2^{2(2x+2)} = 2^{5(x-5)}$$

$$4x+4 = 5x-25$$

$$-x = -29 \quad \boxed{x=29}$$

11. How much money will you have in the bank if you invest \$500 at continuously compounding interest for 3 years?

$$A = Pert$$

rate of 3%

$$A = 500e^{.03(3)}$$

$$A \approx \$547.09$$

12. How many mold spores will be present in your biology lab after 24 hours if you started with 5 mold spores and their growth constant is $k = .0355$?

$$y = ae^{kt}$$

$$y = 5e^{.0355(24)}$$

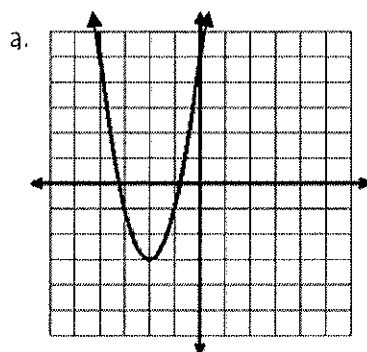
$$y = 11.72 \rightarrow \underline{\underline{11 \text{ spores}}}$$

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Function

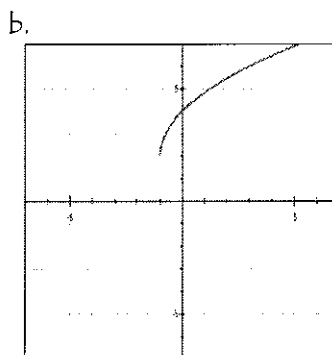
D: _____

R: _____

Inverse

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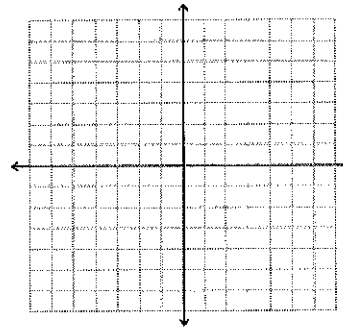
a. $(f \circ g)(x)$

b. $m(h(x))$

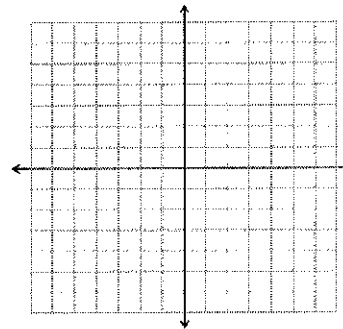
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