EXPONENTS & ROOTS

INVERSE FUNCTIONS

Vertical line test

Function – Is a set of ordered in which each x-coordinate is paired with EXACTLY ONE y-coordinate.

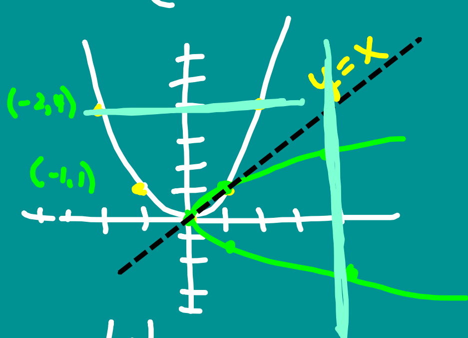
Inverse functions

No $f = \{(2,3)(-5,8)(2,7)(-1,4)\}$

$f = \{(x,y)\}$ $f^{-1} = (y,x)$

$f = \{(3,2)(-7,5)(4,-11)\}$

$f^{-1} = \{(2,3)(5,-7)(-11,4)\}$

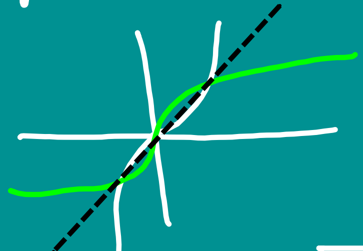


$y = x^2$

0	0
1	1
2	4
3	9

0	0
1	1
4	2
9	3

squrabola



$y = x^3$

Horizontal line test = If the original f passes the horiz. line test, the f^{-1} will be a function.

Find eq. of inverse.

1) Switch x & y variables.
2) Solve for y.

$f(x) = 4x - 7$

$y = 4x - 7$

1) $x = 4y - 7$

2) $\frac{x+7}{4} = \frac{\cancel{4}y}{\cancel{4}}$

$\boxed{\frac{x+7}{4} = f^{-1}}$

$\cancel{f(x)}\, y = \sqrt[3]{2x+7}$

$(x)^3 = \left(\sqrt[3]{2y+7}\right)^3$

$x^3 = 2y + 7$

$\frac{x^3 - 7}{2} = \frac{\cancel{2}y}{\cancel{2}}$

$\boxed{\frac{x^3 - 7}{2} = f^{-1}}$

Given $f(x) = \boxed{\sqrt{2x - 5}}$ $\quad g(x) = \frac{x^2 + 5}{2}$

Are f & g inverse functions?

If $f \circ g$ or $g \circ f = x$, then f & g are inverses.

$g \circ f = \frac{\left(\sqrt{2x-5}\right)^2 + 5}{2}$

$= \frac{2x - \cancel{5} + \cancel{5}}{2}$

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

$= x$

f & g are inverses.

RULES OF EXPONENTS

$3x^{7}$ ← exponent

base

coefficient

7^{5} ← base

Rule #1: $a^m \cdot a^n = a^{m+n}$

$x^3 \cdot x^7 = x^{10}$

$(a^3 b^5 c^4)(a^3 b^7 c^9)$

$= a^6 b^{12} c^{13}$

$7^2 \cdot 7^9 = 7^{11}$

$(2^5 \cdot 3^2)(2^2 \cdot 3^3)$

$= 2^7 \cdot 3^5$

$= 128 \cdot 243$

$= 31{,}104$

NEVER CHANGE THE BASE!

RULE #2 = $(a^m)^n = a^{m \cdot n}$

$(K^3)^5 = K^{15}$

$(2^1 p^3 q^5)^6 = 2^6 p^{18} q^{30}$

$= 64 p^{18} q^{30}$

Rule #3: $\frac{a^m}{a^n} = a^{m-n}$

$\frac{x^6}{x^4} = x^{6-4} = x^2$

$\frac{a^7 b^{11}}{a^5 b^2} = a^2 b^9$

Rule #4: $a^{-m} = \frac{1}{a^m}$

$\frac{1}{a^{-m}} = a^m$

$\frac{f^2}{f^7} = f^{-5} = \frac{1}{f^5}$

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

$5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

$\frac{1}{7^{-3}} = 7^3 = 343$

Rule #5: $a^0 = 1$

$$\frac{f^7}{f^7} = f^0 = 1$$

$$2(\cancel{xy^3})^{\cancel{0}} + 5^0$$

$$= 2(1) + 1$$

$$= 2 + 1$$

$$= \boxed{3}$$

$$\left(\frac{x^3}{y^2}\right)^{-4}$$

$$\left(\frac{y^2}{x^3}\right)^{4}$$

$$= \frac{y^8}{x^{12}}$$

Shortcut

Flip fraction & change to positive exponent.

$$\cancel{\left(\frac{x}{y}\right)^{-2} = \frac{x^{-2}}{y^{-2}} = \frac{y^2}{x^2}}$$

$$\frac{(2^1 a^7 b^3 c^{-2})^3 \cdot (2^1 a^{-4} b^{-1} c^5)^{-2}}{(2a^{-7} b^{11} c^{-5})^2 \underbrace{\cancel{(2a^{41} b^{33} c^{105})^0}}_{1}}$$

$$\frac{(2^3 a^{21} b^9 c^{-6})(2^{-2} a^8 b^2 c^{-10})}{2^2 a^{-14} b^{22} c^{-10}}$$

$$\frac{\cancel{2^1}\, a^{29+14}\, \cancel{b^{11}}\, \cancel{c^{-16}}}{2^{2-1}\, \cancel{a^{-14}}\, b^{22-11}\, c^{-10+16}}$$

$$= \frac{a^{43}}{2^1 b^{11} c^6}$$

Scientific Notation

243,000,000 $\quad 2.43 \times 10^{8}$

0.0792 $\quad 7.92 \times 10^{-2}$

$5.63 \times 10^{-4} \quad 0.000563$

$(2.3 \times 10^{6})(4.7 \times 10^{3})$

$2.3a^{6} \quad 4.7a^{3}$

$= 10.81 \times 10^{9+1}$

$= 1.081 \times 10^{10}$

$$\frac{1.7 \times 10^{5-12}}{3.4 \times 10^{12}}$$

$0.5 \times 10^{-7-1}$

5×10^{-8}