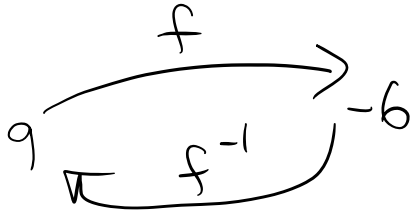
9/29/2021

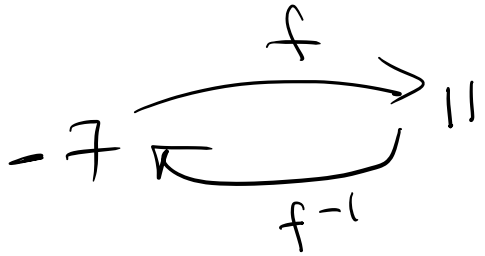
WeBWorK HW set Inverse Functions

#3)

a) If $f(9) = -6$ Then $f^{-1}(-6) = 9$



b) If $f^{-1}(11) = -7$ then $f(-7) = 11$

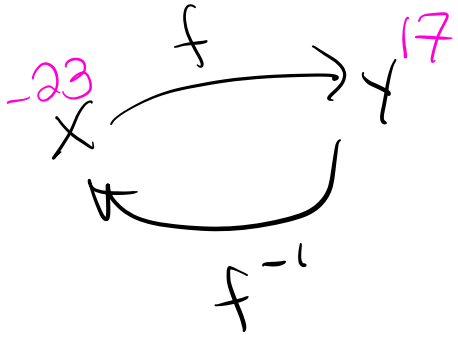


c) If $(-23, 17)$ is a point on the graph of $y = f(x)$, then $f(\boxed{-23}) = \boxed{17}$

and $f^{-1}(\boxed{17}) = \boxed{-23}$

$(-23, 17)$

↑ x value ↑ y value



WeBWork #W Inverse functions #10

#10) If $f(x)=\frac{9e^{3x}+4}{3e^{3x}+1}$, Find the inverse $f^{-1}(x)$.

Strategy

1) Swap x + y

$$y=\frac{9e^{3x}+4}{3e^{3x}+1}$$

$$x=\frac{9e^{3y}+4}{3e^{3y}+1}$$

2) Solve for y!

Cross multiply → $x(3e^{3y}+1)=9e^{3y}+4$

$x3e^{3y}+x=9e^{3y}+4$

$-9e^{3y}-x \quad -9e^{3y}-x$

factor out common factor

$x \cdot 3e^{3y} - 9e^{3y} = 4 - x$

trying to isolate the y terms!

$$e^{3y}\frac{(3x-9)}{(3x-9)} = \frac{4-x}{3x-9}$$

$$e^{3y} = \frac{4-x}{3x-9}$$

Recall
The functions e^x and $\ln x$ are inverses

take ln of both sides

$$\ln(e^{3y}) = \ln\left(\frac{4-x}{3x-9}\right)$$

$$\frac{3y}{3} = \frac{\ln\left(\frac{4-x}{3x-9}\right)}{3}$$

$$y = \frac{1}{3} \cdot \ln\left(\frac{4-x}{3x-9}\right)$$

$$f^{-1}(x) = \frac{1}{3} \cdot \ln\left(\frac{4-x}{3x-9}\right)$$

WebWork Sample Exam

#4) domain → looking at where $f(x)$ is defined → along the x axis

a) $[-7,-3] \cup [-1,5)$

Note: There is a "jump" at $x=1$ but $f(x)$ is still defined there $f(1)=-3$

b) range → looking at the y-values the f(x) takes on → look along the y-axis

$[-7, 8]$

WeBWork HW Set - Functions Notation

$$f(x) = \frac{\sqrt{6-x}}{-x^2+9x-18}$$

We must exclude any x values that give zero denominator or a negative under the radical from the domain of f(x)

Given $\sqrt{6-x}$

$6-x < 0$

$+x \quad +x$

$6 < x$ ← These are equivalent

or $x > 6$

test $x=7$

$\sqrt{6-7} = \sqrt{-1}$ ✗

exclude from domain

$-x^2+9x-18=0$

Solve for x

→ multiply Through by -1

$x^2-9x+18=0$

$(x-3)(x-6)=0$

$x-3=0 \quad x-6=0$

$\boxed{x=3} \quad \boxed{x=6}$

exclude these values from the domain

Check → $-(3)^2+9\cdot3-18 \stackrel{?}{=} 0$ ✓

$-9+27-18=0$

So what do we keep?

$x \leq 6$

but Kill $x=3$ & $x=6$

domain $\boxed{(-\infty, 3) \cup (3, 6)}$

WeBWork HW set Functions - Piecewise

#7) $y = \begin{cases} -\frac{3}{4}x-5 & \text{if } x<-4 \\ -2x-3 & \text{if } -2 \leq x < 0 \\ 5x-5 & \text{if } 1 < x \end{cases}$ equivalent to $x>1$

a) What is the domain? For a piecewise function look at the inequalities and write them using interval notation & add in "U"

$(-\infty, -4) \cup (-2, 0) \cup (1, +\infty)$

b) Evaluate $f(a)$ for each of the following

a) $f(-1) = -2(-1) - 3$

$2 - 3 = -1$

b) $f(-6) = -\frac{3}{4}(-6) - 5 = \frac{9}{2} - 5 = \frac{9}{2} - \frac{10}{2} = -\frac{1}{2}$

c) $f(-4) =$ undefined

d) $f(3) = 5 \cdot 3 - 5 = 15 - 5 = 10$