

Inverse Functions

BARE FEET



SOCKED FEET

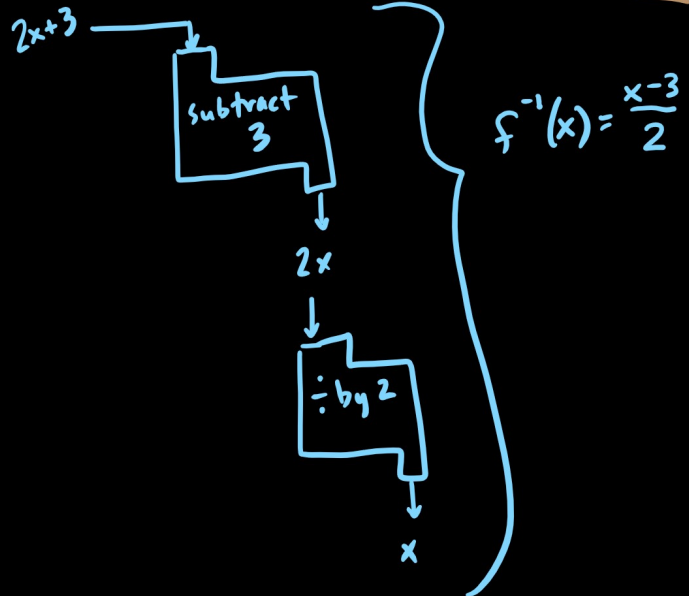
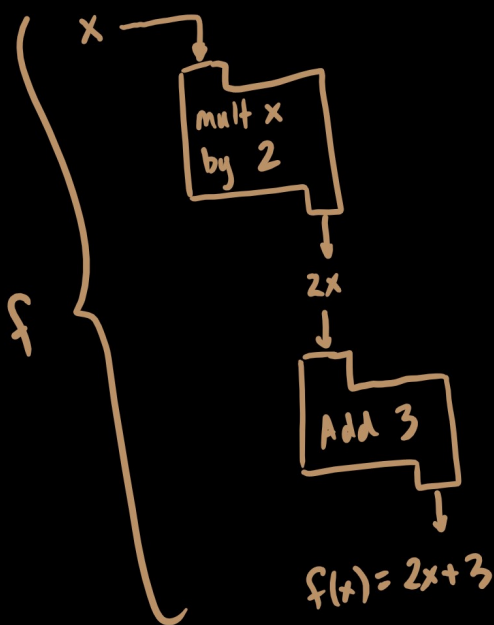


SOCKED AND SHOED FEET

SOCKED AND SHOED FEET



BARE FEET



$f^{-1}(x)$ is the inverse function of $f(x)$.

For $f(x)$ and $f^{-1}(x)$ to be inverses,

$$f(f^{-1}(x)) = x \quad f^{-1}(f(x)) = x.$$



$$f(x) = 2x + 3 \quad f^{-1}(x) = \frac{x-3}{2}$$

$$f(f^{-1}(x)) = 2\left(\frac{x-3}{2}\right) + 3 = x - 3 + 3 = x$$

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

ex: Show that $f(x) = 5x - 7$ and $f^{-1}(x) = \frac{x+7}{5}$

are inverses.

$$f(f^{-1}(x)) = 5\left(\frac{x+7}{5}\right) - 7 = x + 7 - 7 = x$$

$$f^{-1}(f(x)) = \frac{5x - 7 + 7}{5} = \frac{5x}{5} = x$$

ex: Find $f^{-1}(x)$ if $f(x) = 4x - 9$

"SOCKS AND SHOES"

f : mult by 4
subtract 9

f^{-1} : add 9
÷ by 4

$$f^{-1}(x) = \frac{x+9}{4}$$

$$f(x) = 4x - 9$$

x	y
-1	-13
0	-9
1	-5
2	-1

"REAL WAY"

1) Replace $f(x)$ with y : $y = 4x - 9$

2) Switch x and y : $x = 4y - 9$

3) Solve for y : $x + 9 = 4y$

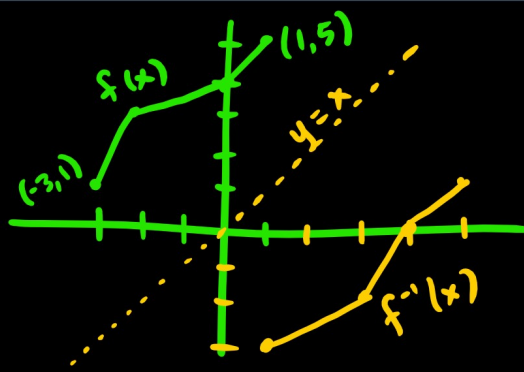
$$\frac{x+9}{4} = y$$

4) Replace y with $f^{-1}(x)$:

$$f^{-1}(x) = \frac{x+9}{4}$$

$$f^{-1}(x) = \frac{x+9}{4}$$

x	y
-13	-1
-9	0
-5	1
-1	2



p593-594
 15-23 odd, 25, 27, 29, 30, 41, 42
 part a

$$21) f(x) = \frac{3}{x-4} \quad g(x) = \frac{3}{x} + 4$$

$$f(g(x)) = \frac{3}{\frac{3}{x} + 4 - 4} = \frac{3}{\frac{3}{x}} = \cancel{3} \cdot \frac{x}{\cancel{3}} = x$$

$$g(f(x)) = \frac{3}{\frac{3}{x-4}} + 4 = \cancel{3} \cdot \frac{x-4}{\cancel{3}} + 4 = x-4+4 = x$$