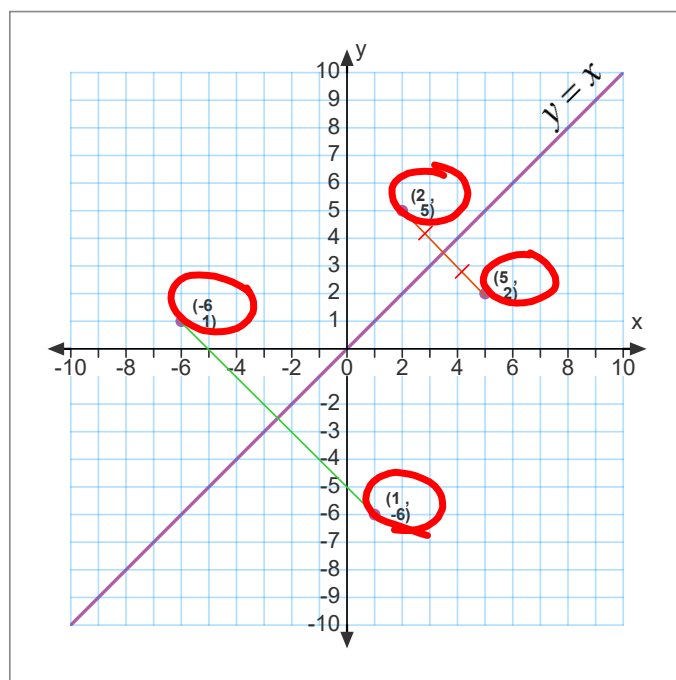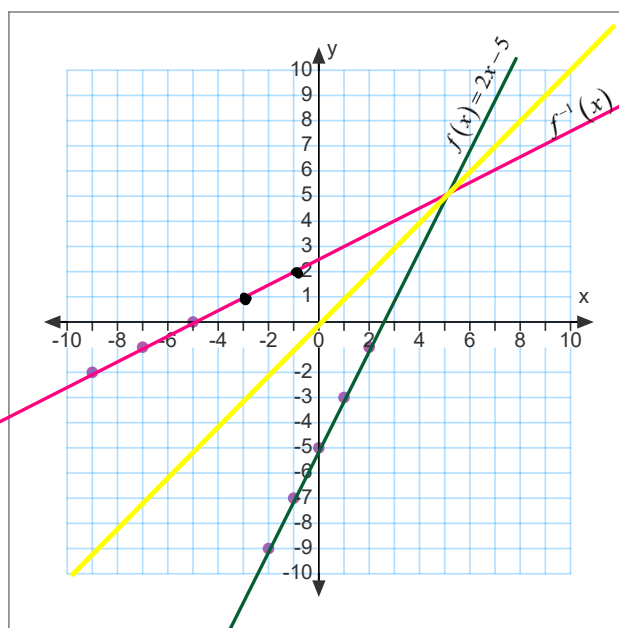# Inverse of a Function

- The inverse of a function $\left(f^{-1}\right)$ is the reflection of that function over the line $y = x$.

- Recall that for this reflection, the rule is
$$(x, y) \rightarrow (y, x)$$

$$f(x) = 2x - 5$$

x	y
-2	−9
-1	−7
0	−5
1	−3
2	−1

$$f^{-1}(x)$$

x	y
−9	−2
−7	−1
−5	0
−3	1
−1	2

$$\mathrm{Dom}\, f = \mathrm{Ran}\, f^{-1}$$
$$\mathrm{Ran}\, f = \mathrm{Dom}\, f^{-1}$$

Rule of the inverse:

$$f(x)$$
$$y = 2x - 5$$

$$\longrightarrow$$

$$f^{-1}(x)$$
$$x = 2y - 5 \qquad \text{Isolate } y$$

$$x + 5 = 2y$$

$$\frac{x+5}{2} = y \quad \text{or} \quad \frac{x}{2} + \frac{5}{2} = y$$

Determine the rule of the inverse of the following second-degree function: $f(x) = -\dfrac{1}{2}(x-3)^2 + 8$

Switch the x & y

$x = -\dfrac{1}{2}(y-3)^2 + 8$ isolate y

$x - 8 = -\dfrac{1}{2}(y-3)^2$

$-2(x-8) = (y-3)^2$

$\pm\sqrt{-2(x-8)} = y - 3$

$y = \pm\sqrt{-2(x-8)} + 3$