

$f(x)$ }
 ↑ Function }
 $f^{-1}(x)$ }
 y^{-1} } inverse

6A 3 Inverse Functions – Graphing + Domain/Range

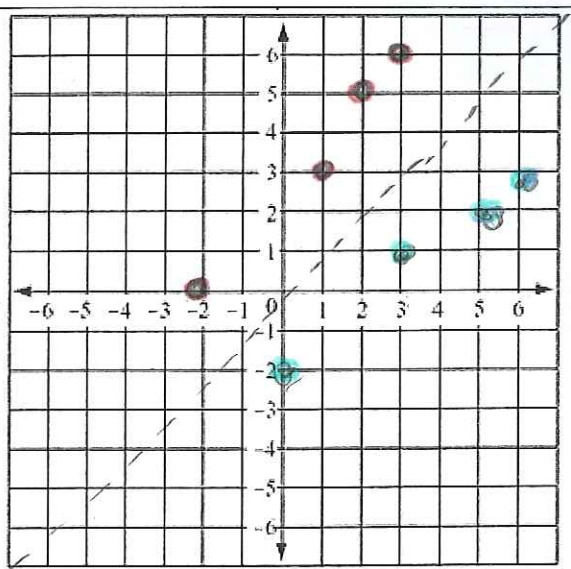
Classwork / Homework

For each of the relations given, fill in the information requested. You should be able to fill in all that information BEFORE graphing it, but after you graph it, check that your graph matches the information given.

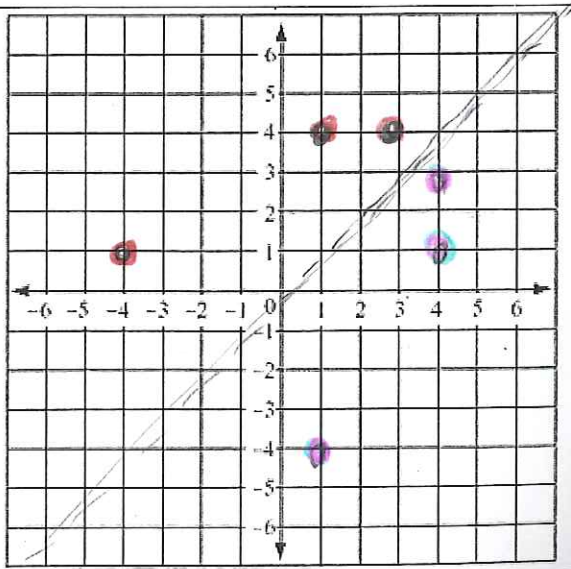
Then, find the inverse of the relation. You should be able to fill in the information about the inverse before graphing it, but then graph it to a) check your information) and b) see the reflection over $y = x$.

It may help to use two different colored pencils for each graph.

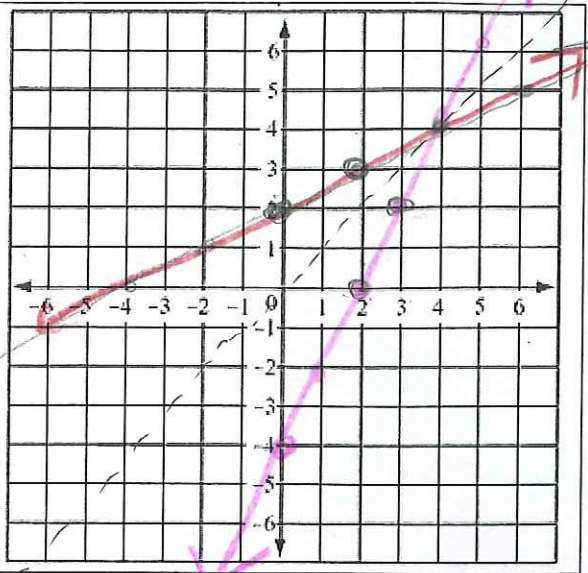
1.		THE INVERSE	
$(3,6), (1,3), (2,5), (-2,0)$		$(6,3) (3,1)$ $(5,2), (0,-2)$	
Function or Relation		Function or Relation	
D:	$x \in \{-2, 1, 2, 3\}$	D:	$x \in \{0, 3, 5, 6\}$
R:	$y \in \{0, 3, 5, 6\}$	R:	$y \in \{-2, 1, 2, 3\}$



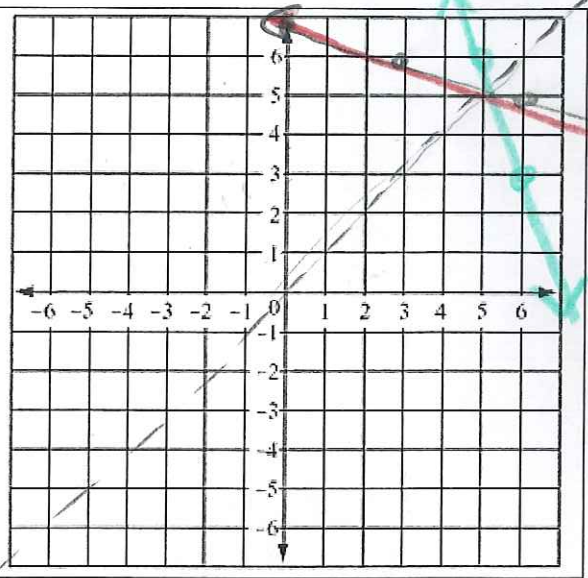
2.		THE INVERSE	
$(-4,1), (1,4), (3,4)$		$(1,-4) (4,1) (4,3)$	
Function or Relation		Function or Relation	
D:	$x \in \{-4, 1, 3\}$	D:	$x \in \{1, 4\}$
R:	$y \in \{1, 4\}$	R:	$y \in \{-4, 1, 3\}$



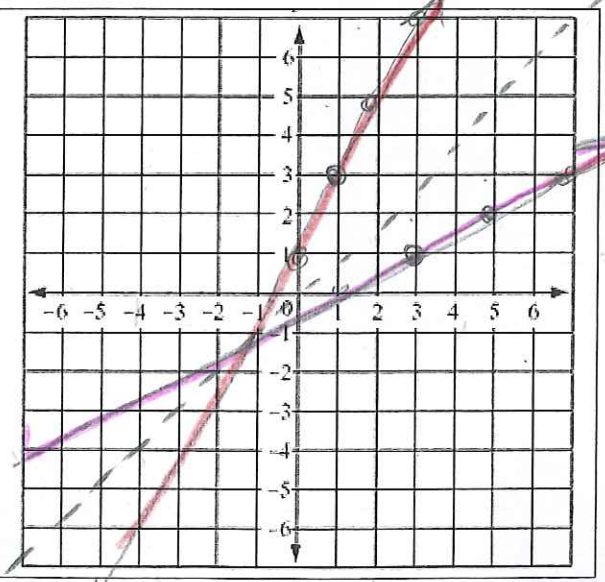
3	$y = \frac{1}{2}x + 2$ $x = \frac{1}{2}y + 2$ $x - 2 = \frac{1}{2}y$ $y = 2(x - 2)$	THE INVERSE	
		$y^{-1} = 2x - 4$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \in \mathbb{R}$
R:	$y \in \mathbb{R}$	R:	$y \in \mathbb{R}$



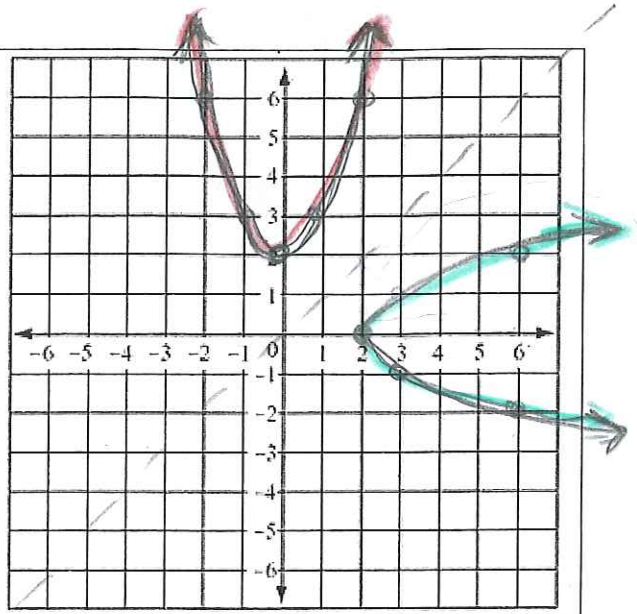
4	$y = -\frac{1}{3}x + 7$ $x = -\frac{1}{3}y + 7$ $3(x - 7) = -\frac{1}{3}y$ $y = -3(x - 7)$	THE INVERSE	
		$y^{-1} = -3x + 21$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \in \mathbb{R}$
R:	$y \in \mathbb{R}$	R:	$y \in \mathbb{R}$



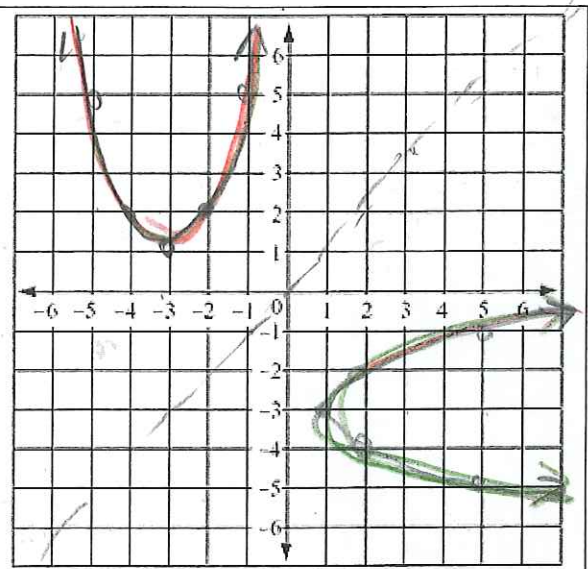
5	$y = 2(x - 1) + 3$ $x = 2(y - 1) + 3$ $\frac{x - 3}{2} = \frac{2}{2}(y - 1)$ $y - 1 = \frac{1}{2}(x - 3)$ $y = \frac{1}{2}(x - 3) + 1$	THE INVERSE	
		$y^{-1} = \frac{1}{2}(x - 3) + 1$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \in \mathbb{R}$
R:	$y \in \mathbb{R}$	R:	$y \in \mathbb{R}$



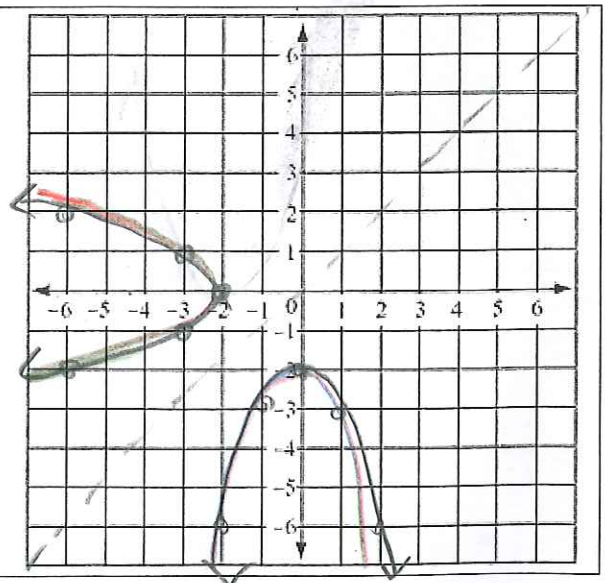
6. $y = x^2 + 2$		THE INVERSE	
$x = y^2 + 2$ $-2 \quad -2$ $\pm\sqrt{x-2} = \sqrt{y^2}$		$y^{-1} = \pm\sqrt{x-2}$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \geq 2$
R:	$y \geq 2$	R:	$y \in \mathbb{R}$



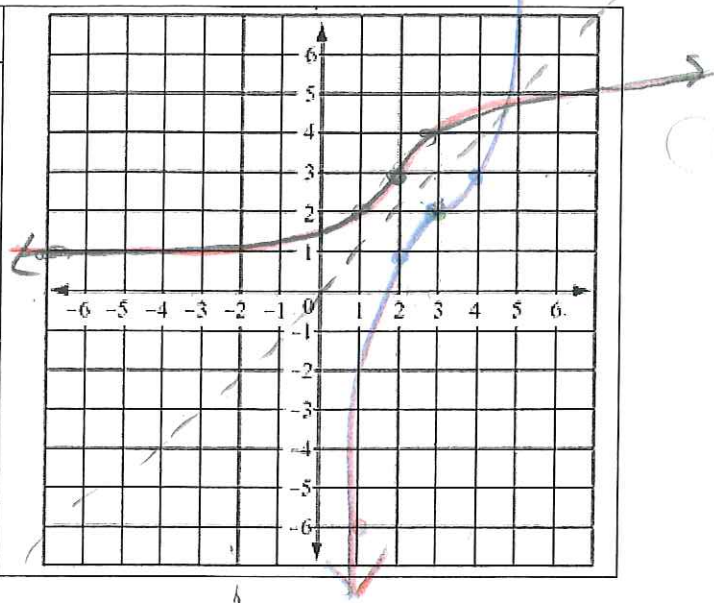
7. $y = (x+3)^2 + 1$		THE INVERSE	
$x = (y+3)^2 + 1$ $\pm\sqrt{x-1} = (y+3)^2$		$y^{-1} = \pm\sqrt{x-1} - 3$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \geq 1$
R:	$y \geq 1$	R:	$y \in \mathbb{R}$



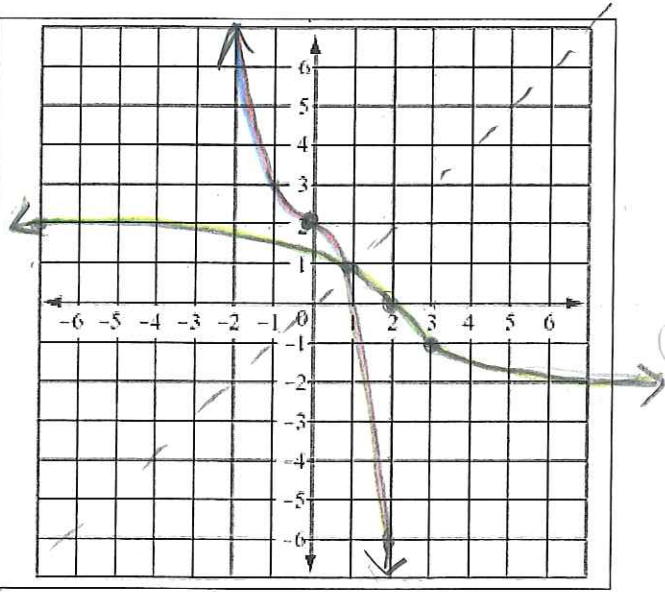
8. $y = -x^2 - 2$		THE INVERSE	
$x = -y^2 - 2$ $(x+2) = -y^2$ $-(x+2)$		$y^{-1} = \pm\sqrt{-x-2}$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \leq -2$
R:	$y \leq -2$	R:	$y \in \mathbb{R}$



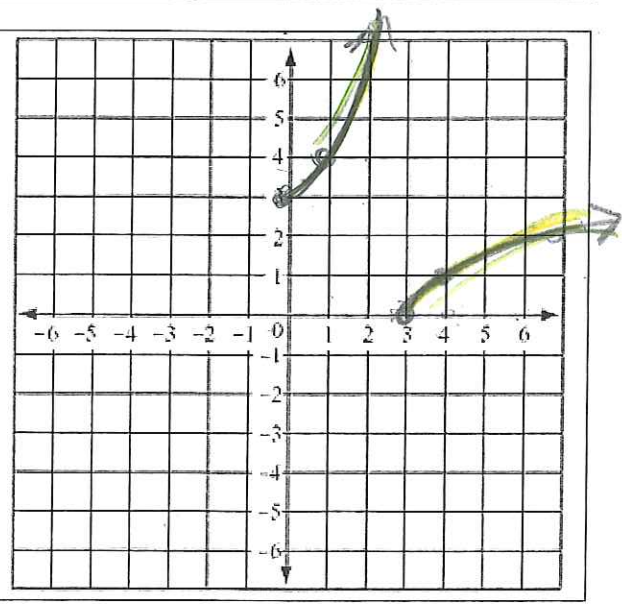
9		THE INVERSE	
$y = (x-3)^3 + 2$ $x = (y-2)^3 + 3$ $\sqrt[3]{x-2} = \sqrt[3]{y-3}$		$y^{-1} = \sqrt[3]{x-2} + 3$	
Function or Relation		Function or Relation	
D:		D:	
R:		R:	



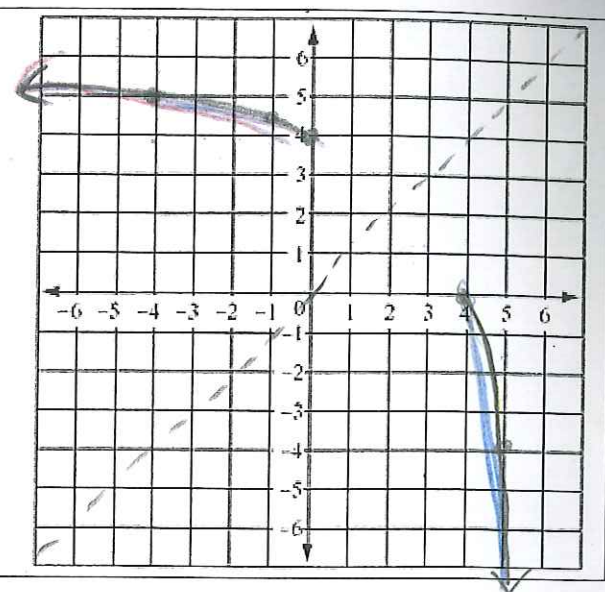
10		THE INVERSE	
$y = -(x-2)^3$ $x = -(y-2)^3$ $\sqrt[3]{-x} = \sqrt[3]{y-2}$		$y^{-1} = \sqrt[3]{-x} + 2$	
Function or Relation		Function or Relation	
D:	$x \in \mathbb{R}$	D:	$x \in \mathbb{R}$
R:	$y \in \mathbb{R}$	R:	$y \in \mathbb{R}$



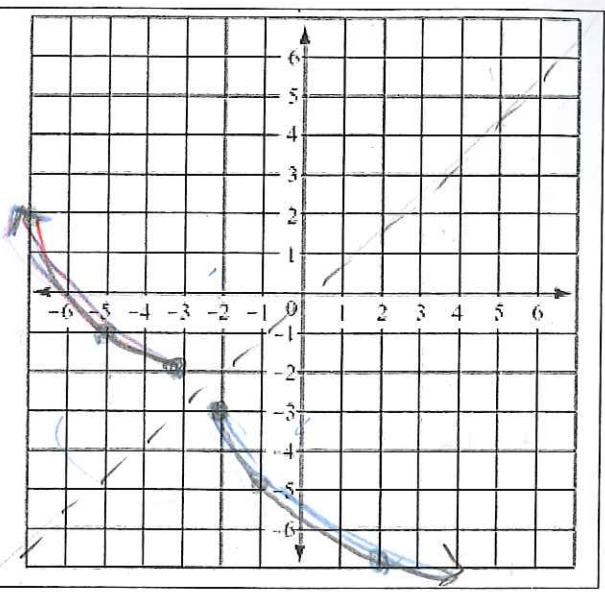
11		THE INVERSE	
$y = \sqrt{x-3}$ $x = y^2 + 3$ $x^2 = y-3$		$y^{-1} = x^2 + 3$ <i>only on this domain!</i>	
Function or Relation		Function or Relation	
D:	$x \geq 3$	D:	$x \geq 0$
R:	$y \geq 0$	R:	$y \geq 3$



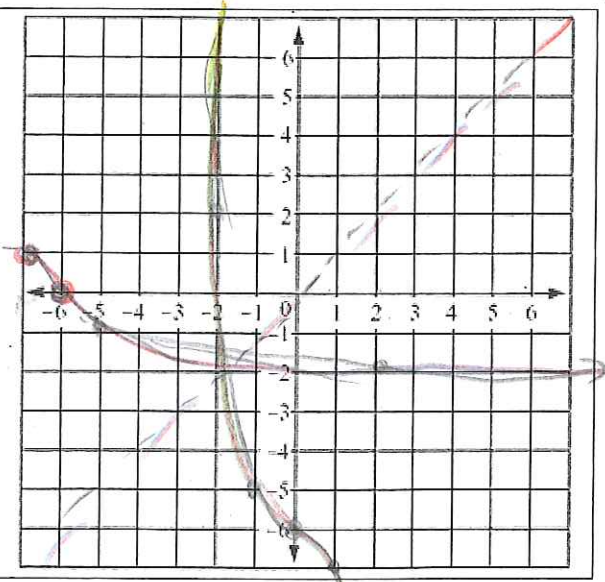
12		THE INVERSE	
$y = \frac{1}{2}\sqrt{-x} + 4$ $x = \frac{1}{2}\sqrt{-y} + 4$ $(x-4)^2 = \left(\frac{1}{2}\sqrt{-y}\right)^2$		$x-4 = \frac{1}{4}(-y)$ $y = -4(x-4)^2$ $x \geq 4$	
Function or Relation		Function or Relation	
Domain:	$x \leq 0$	Domain:	$x \geq 4$
Range:	$y \geq 4$	Range:	$y \leq 0$



13		THE INVERSE	
$y = -2\sqrt{x+2} - 3$ $x+3 = -2\sqrt{y+2}$ $\left(-\frac{1}{2}(x+3)\right)^2 = (y+2)^2$ $\frac{1}{4}(x+3)^2 = y+2$		$y = \frac{1}{4}(x+3)^2 + 2$ $x \geq -2$	
Function or Relation		Function or Relation	
Domain:	$x \leq -3$	Domain:	$x \geq -2$
Range:	$y \geq -2$	Range:	$y \leq 3$



14		THE INVERSE	
$y = -\sqrt[3]{-x-6}$		$y = -x^3 - 6$	
Function or Relation		Function or Relation	
Domain:	$x \in \mathbb{R}$	Domain:	$x \in \mathbb{R}$
Range:	$y \in \mathbb{R}$	Range:	$y \in \mathbb{R}$



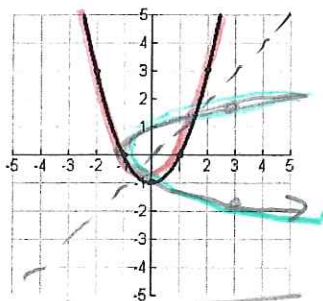
For each of the following, $f(x)$ is given. Determine if $f(x)$ is a function, then give its domain and range. Then, get $f^{-1}(x)$, determine if it's a function and what its domain and range is. Then sketch both to confirm they are reflections over the line $y = x$.

verify on Desmos.com

1. $(2, 5), (-2, 5), (6, -4), (6, 0)$
2. $y = -8x + 16$
3. $y = \frac{1}{2}x + 8$
4. $y = x^2 - 4$
5. $y = (x-6)^2$
6. $y = \frac{1}{2}(x-1)^3 + 6$
7. $y = \sqrt{x-2}$
8. $y = \frac{1}{4}\sqrt{x} + 6$
9. $(-3, 7), (4, -2), (6, 5), (4, 1)$
10. $y = -\frac{5}{8}x + 10$
11. $y = x^2 + 5$
12. $y = (x+3)^2$
13. $y = 16(x-1)^2 + 5$
14. $y = -x^3 + 4$
15. $y = \sqrt{-x+5} - 2$
16. $y = -\frac{1}{3}\sqrt{x-1}$

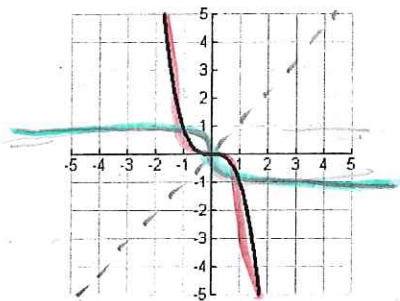
For each of the graphs below, write the equation of $f(x)$, then write the equation of and graph $f^{-1}(x)$

17. $f(x) = x^2 - 1$



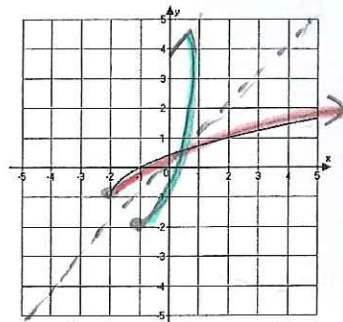
$f^{-1}(x) = \pm\sqrt{x+1}$

18. $f(x) = -x^3$



$f^{-1}(x) = -\sqrt[3]{x}$

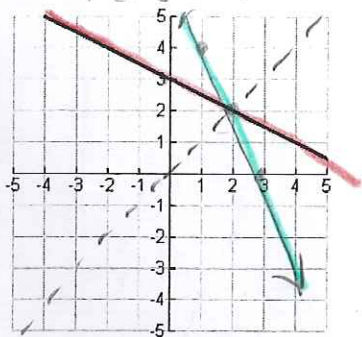
19. $f(x) = \sqrt{x+2} - 1$



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

20.

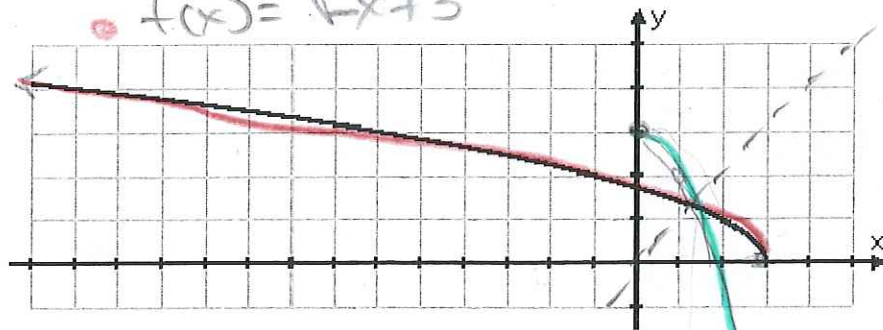
$f(x) = -\frac{1}{2}x + 3$



$f^{-1}(x) = -2x + 6$

21.

$f(x) = \sqrt{-x+3}$



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