Advanced Algebra
WS: Inverses

Name ______________________

For the following, find the inverse of the relation/function. Given the domain of the inverse.

1. {(8, -2), (-7, 3), (1/2, 0), (-3, 4)}

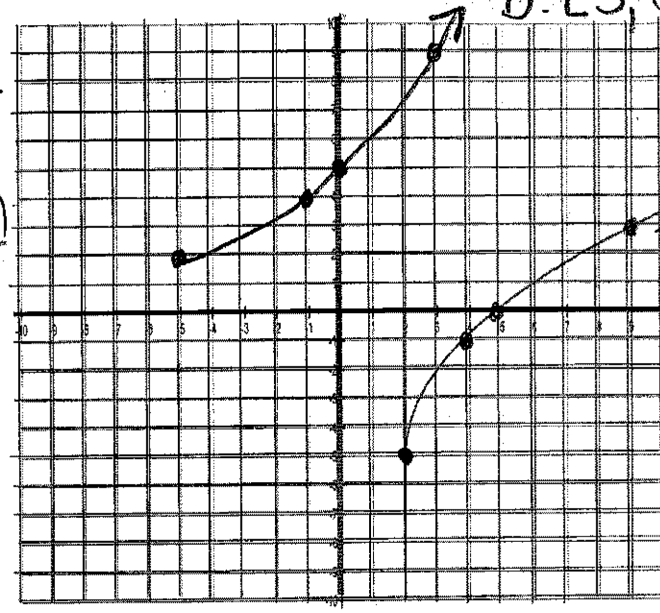
$\{(-2, 8), (3, -7), (0, 1/2), (4, -3)\}$

D: $\{-2, 0, 3, 4\}$

2.

D: $[5, \infty)$

x	f(x)
2	-5
4	-1
5	0
9	3



x	$f^{-1}(x)$
-5	2
-1	4
0	5
3	9

3. $f(x) = \frac{8}{5}x - 14$

4. $y = -5(x-3)^{1/4} + 5$

5. $f(x) = \frac{2}{x+5} - 3$

6. $f(x) = 3(-x+7)^5 + 5$

7. $y = -\sqrt[3]{4(x-3)}$

8. $f(x) = -6x + 7$

9. $f(x) = \left(\frac{1}{2}x + 8\right)^4 - 6$

10. $y = -\frac{1}{5}(x-2)^3 + 4$

11. $f(x) = \frac{1}{5}\sqrt{3x+18} - 4$

12. $y = \frac{-1}{x-8} + 5$

13. $y = -\frac{1}{2}x + \frac{5}{4}$

14. $y = 3(2x-4)^2 - 9$

3. $f(x) = \frac{8}{5}x - 14$

$x = \frac{8}{5}y - 14$

$x + 14 = \frac{8}{5}y$

$y = \frac{5}{8}(x + 14)$

$\boxed{f^{-1}(x) = \frac{5}{8}x + \frac{35}{4},\ D: (-\infty, \infty)}$

4. $y = -5(x-3)^{1/4} + 5$ $\qquad x \geq 3,\ y \leq 5$

$x = -5(y-3)^{1/4} + 5$

$x - 5 = -5(y-3)^{1/4}$

$-\frac{1}{5}(x-5) = (y-3)^{1/4}$

$(-\frac{1}{5}(x-5))^4 = y - 3$

$\boxed{y = (-\frac{1}{5}(x-5))^4 + 3,\ D: (-\infty, 5]}$

5. $f(x) = \frac{2}{x+5} - 3$

$x = \frac{2}{y+5} - 3$

$\frac{x+3}{1} = \frac{2}{y+5}$

$(x+3)(y+5) = 2$

$y + 5 = \frac{2}{x+3}$

$\boxed{f^{-1}(x) = \frac{2}{x+3} - 5,\ D: (-\infty, -3) \cup (-3, \infty) \text{ or } x \neq -3}$

6. $f(x) = 3(-x+7)^5 + 5$
$= 3(-(x-7))^5 + 5$

$x = 3(-(y-7))^5 + 5$
$x - 5 = 3(-(y-7))^5$
$\frac{1}{3}(x-5) = (-(y-7))^5$
$\sqrt[5]{\frac{1}{3}(x-5)} = -(y-7)$
$-\sqrt[5]{\frac{1}{3}(x-5)} = y - 7$

$\boxed{f^{-1}(x) = -\sqrt[5]{\frac{1}{3}(x-5)} + 7, \quad D: (-\infty, \infty)}$

7. $y = -\sqrt[3]{4(x-3)}$
$x = -\sqrt[3]{4(y-3)}$
$-x = \sqrt[3]{4(y-3)}$
$(-x)^3 = 4(y-3)$
$\frac{1}{4}(-x)^3 = y - 3$

$\boxed{y = \frac{1}{4}(-x)^3 + 3, \quad D: (-\infty, \infty)}$

8. $f(x) = -6x + 7$
$x = -6y + 7$
$x - 7 = -6y$
$y = -\frac{1}{6}(x-7)$

$\boxed{f^{-1}(x) = -\frac{1}{6}x + \frac{7}{6}, \quad D: (-\infty, \infty)}$

9. $f(x) = (\frac{1}{2}x + 8)^4 - 6 = (\frac{1}{2}(x+16))^4 - 6$

$x = (\frac{1}{2}(y+16))^4 - 6$

$x + 6 = (\frac{1}{2}(y+16))^4$

$\sqrt[4]{x+6} = \frac{1}{2}(y+16)$

$2\sqrt[4]{x+6} = y + 16$

$\boxed{f^{-1}(x) = 2\sqrt[4]{x+6} - 16, \quad D: [-6, \infty)}$

10. $y = -\frac{1}{5}(x-2)^3 + 4$

$x = -\frac{1}{5}(y-2)^3 + 4$

$x - 4 = -\frac{1}{5}(y-2)^3$

$-5(x-4) = (y-2)^3$

$\sqrt[3]{-5(x-4)} = y - 2$

$\boxed{y = \sqrt[3]{-5(x-4)} + 2, \quad D: (-\infty, \infty)}$

11. $f(x) = \frac{1}{5}\sqrt{3x+18} - 4 = \frac{1}{5}\sqrt{3(x+6)} - 4$

$x = \frac{1}{5}\sqrt{3(y+6)} - 4$ $\qquad x \geq -6, \; y \geq -4$

$x + 4 = \frac{1}{5}\sqrt{3(y+6)}$

$5(x+4) = \sqrt{3(y+6)}$

$(5(x+4))^2 = 3(y+6)$

$\frac{1}{3}(5(x+4))^2 = y + 6$

$\boxed{f^{-1}(x) = \frac{1}{3}(5(x+4))^2 - 6, \quad D: [-4, \infty)}$

12. $y = \frac{-1}{x-8} + 5$

$\frac{y-5}{1} = \frac{-1}{x-8}$

$(y-5)(x-8) = -1$

$y - 5 = \frac{-1}{x-8}$

$\boxed{y = \frac{-1}{x-8} + 5, \quad x \neq 8}$

13. $y = -\frac{1}{2}x + \frac{5}{4}$

$x = -\frac{1}{2}y + \frac{5}{4}$

$x - \frac{5}{4} = -\frac{1}{2}y$

$y = -2(x - 5/4)$

$\boxed{y = -2x + 5/2,\ D: (-\infty, \infty)}$

14. $y = 3(2x-4)^2 - 9 = 3(2(x-2))^2 - 9$

$x = 3(2(y-2))^2 - 9$

$x + 9 = 3(2(y-2))^2$

$\frac{1}{3}(x+9) = (2(y-2))^2$

$\sqrt{\frac{1}{3}(x+9)} = 2(y-2)$

$\frac{1}{2}\sqrt{\frac{1}{3}(x+9)} = y - 2$

$\boxed{y = \frac{1}{2}\sqrt{\frac{1}{3}(x+9)} + 2,\ D: [-9, \infty)}$