Arroyo P.6

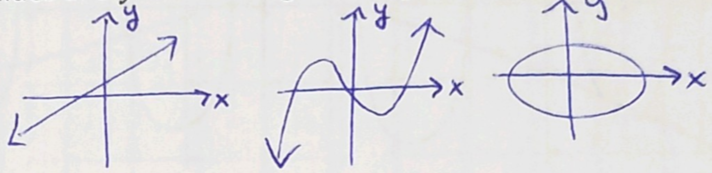
Notes: 26.2/26.3 Inverses (of Squares and Cubes)

Relation – An equation, graph, or table showing the relationship between x-values and y-values. Might or might not be a function.

$y = 2x + 1$

$x^2 + y^2 = 4$

$\sqrt{x+1} = y$



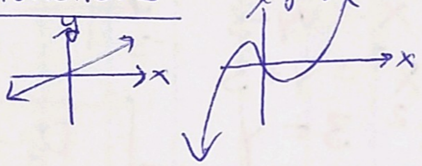
x	y
2	7
-1	0
2	9
10	3

Function – Every x-value is paired with only one y-value. The graph will pass the vertical line test.

are functions

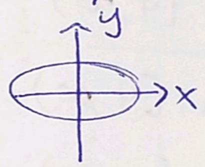
$y = 2x + 1$

$y = \sqrt{x+1}$



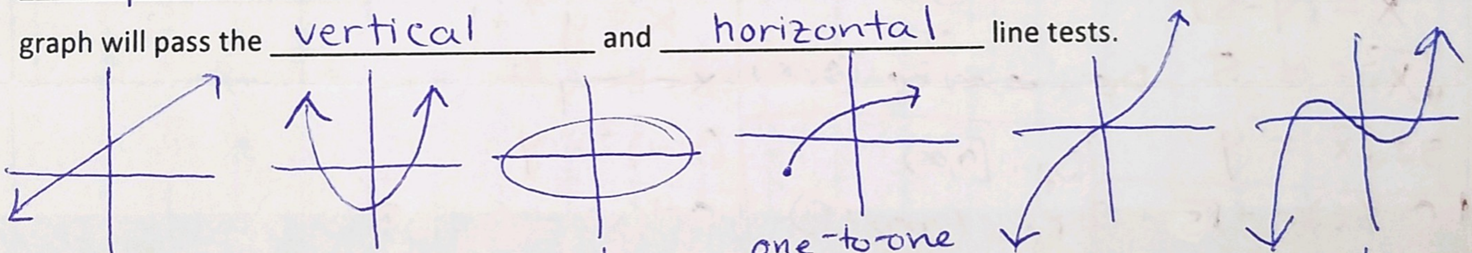
not functions

$x^2 + y^2 = 4$



x	y
2	7
-1	0
2	9
10	3

One-to-One – Every x-value is paired with only one y-value & every y-value is paired with only one x-value. It is difficult to tell from the equation if it is one-to-one. The graph will pass the vertical and horizontal line tests.



one-to-one | not | not | one-to-one | one-to-one | not

Inverses – switch the x-values and the y-values. You must be careful with the domain and range. Inverse functions inherit any restrictions of the original function.

Inverses Graphically – Switch the x-values and the y-values OR reflect the graph over the line $y = x$.

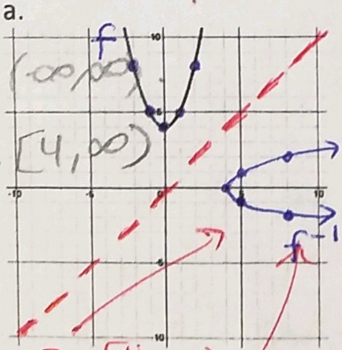
Ex #1 Sketch the inverse relation and state the domain & range of the inverse relation.

a.

f

D: $(-\infty, \infty)$

R: $[4, \infty)$



f^{-1}

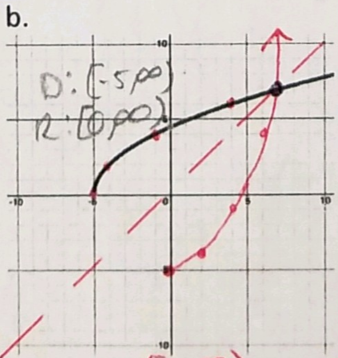
D: $[4, \infty)$

R: $(-\infty, \infty)$

b.

D: $[-5, \infty)$

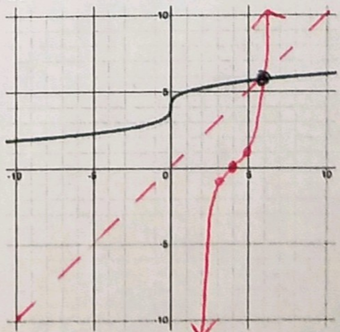
R: $[0, \infty)$



D: $[0, \infty)$

R: $[-5, \infty)$

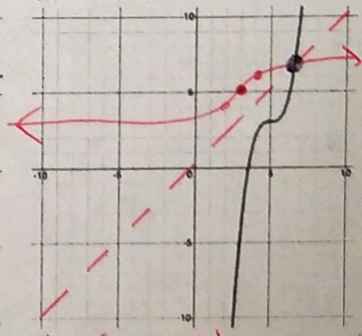
c.



D: $(-\infty, \infty)$

R: $(-\infty, \infty)$

d.

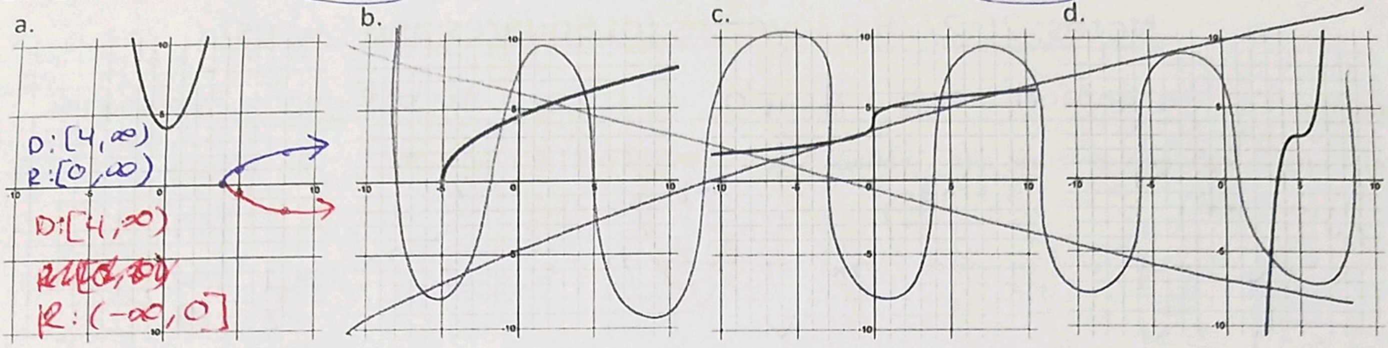


D: $(-\infty, \infty)$

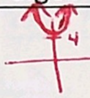
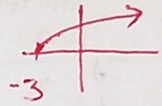
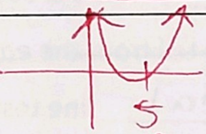
R: $(-\infty, \infty)$

Ex #2 Sketch the inverse *function* and sate the domain & range of the inverse *function*.

a. b. c. d.



Inverses Algebraically – Switch the variables. Solve for y. Remember the "inherited" domain and range.
Ex #3 Find the inverse f^{-1} algebraically and state the domain and range of the inverse. → wed

a. $f(x) = x^2 + 4$  $y = x^2 + 4$ $x = y^2 + 4$ $x - 4 = y^2$ $\pm\sqrt{x-4} = y$ $\boxed{f^{-1}(x) = \pm\sqrt{x-4}}$ $D_f: (-\infty, \infty)$ $R_f: [4, \infty)$ $D_{f^{-1}}: [4, \infty)$ $R_{f^{-1}}: (-\infty, \infty)$	b. $f(x) = \sqrt{x+3}$  -3 $x = \sqrt{y+3}$ $x^2 = y + 3$ $x^2 - 3 = y$ $\boxed{f^{-1}(x) = x^2 - 3}$ $D_f: [-3, \infty)$ $R_f: [0, \infty)$ $D_{f^{-1}}: [0, \infty)$ $R_{f^{-1}}: [-3, \infty)$
c. $f(x) = (x-5)^2$  5 $x = (y-5)^2$ $\pm\sqrt{x} = y - 5$ $5 \pm \sqrt{x} = y$ $\boxed{f^{-1}(x) = \pm\sqrt{x} + 5}$ $D_f: (-\infty, \infty)$ $R_f: [0, \infty)$ $D_{f^{-1}}: [0, \infty)$ $R_{f^{-1}}: (-\infty, \infty)$	d. $f(x) = x^{\frac{1}{2}} + 1$ $x = y^{1/2} + 1$ $x - 1 = y^{1/2}$ $(x-1)^2 = y$ $\boxed{f^{-1}(x) = (x-1)^2}$
e. $f(x) = x^2 + 6x + 9$	f. $f(x) = \sqrt[3]{x} + 5$ $x = \sqrt[3]{y} + 5$ $x - 5 = \sqrt[3]{y}$ $(x-5)^3 = y$ $\boxed{f^{-1}(x) = (x-5)^3}$
g. $f(x) = \frac{1}{2}(x-2)^3$	h. $f(x) = (x+5)^3$