

3.3 Function Operations & Compositions

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"It's important to learn math because someday you might accidentally buy a phone without a calculator."

ex: Let

$$f(x) = \sqrt{x}$$

$$m(x) = x^2$$

$$g(x) = \sqrt[5]{x}$$

$$n(x) = (x+5)$$

$$h(x) = \frac{1}{x}$$

$$p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

a) $(f \circ n)(x)$ $\sqrt{x+5}$

$$\{x \mid \begin{array}{l} x+5 \geq 0 \\ x \geq -5 \end{array}\}$$

ex: Let

$$f(x) = \sqrt{x}$$

$$m(x) = x^2$$

$$g(x) = \sqrt[5]{x}$$

$$n(x) = x + 5$$

$$h(x) = \frac{1}{x}$$

$$p(x) = (x^2 - 10x + 25)$$

Find the composition and state the domain.

b) $(h \circ p)(x)$

$$\frac{1}{x^2 - 10x + 25} = \frac{1}{(x-5)^2}$$

$$\{x \mid x \neq 5\}$$

ex: Let

$$f(x) = \sqrt{x} \quad m(x) = (x^2)$$

$$g(x) = \sqrt[5]{x} \quad n(x) = x + 5$$

$$h(x) = \frac{1}{x} \quad p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

$$c) (f \circ n)(x) = \sqrt{x^2} = |x| \quad \{x \mid x \in \mathbb{R}\}$$

ex: Let

$$f(x) = \sqrt{x}$$

$$m(x) = x^2$$

$$g(x) = \sqrt[5]{x}$$

$$n(x) = (x+5)$$

$$h(x) = \frac{1}{x}$$

$$p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

$$d) (p \circ n)(x) = (x+5)^2 - 10(x+5) + 25$$

$$D: \{x \mid x \in \mathbb{R}\} = \mathbb{R}$$

$$(x-5)^2$$
$$(x+5-5)^2 = x^2$$

ex: Let

$$f(x) = \sqrt{x}$$

$$m(x) = x^2$$

$$g(x) = \sqrt[5]{x}$$

$$n(x) = x + 5$$

$$h(x) = \frac{1}{x}$$

$$p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

e) $(n \circ h)(x) = \frac{1}{x} + 5 = \frac{1 + 5x}{x} \quad \{x | x \neq 0\}$

f) $(f \circ g)(x) = \sqrt{\sqrt[5]{x}} = x^{1/10} \quad \{x | x \geq 0\}$

g) $(m \circ f)(x) = (\sqrt{x})^2 = x \quad \{x | x \geq 0\}$

ex: Let

$$f(x) = \sqrt{x}$$

$$m(x) = x^2$$

$$g(x) = \sqrt[5]{x}$$

$$n(x) = x + 5$$

$$h(x) = \frac{1}{x}$$

$$p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

f) $(f \circ g)(x)$

ex: Let

$$f(x) = \sqrt{x}$$

$$m(x) = x^2$$

$$g(x) = \sqrt[5]{x}$$

$$n(x) = x + 5$$

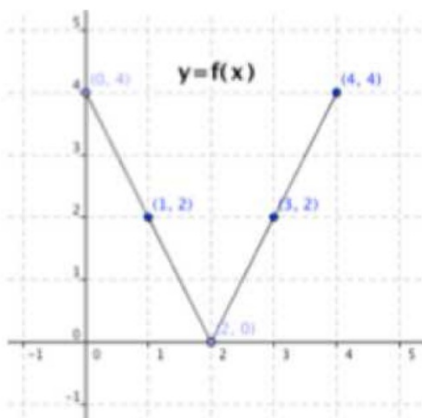
$$h(x) = \frac{1}{x} = \left(\frac{1}{\frac{1}{x}} \right) p(x) = x^2 - 10x + 25$$

Find the composition and state the domain.

h) $(h \circ h)(x) = x \quad \{x | x \neq 0\}$

~~g) $(m \circ f)(x)$~~

ex: Evaluate.



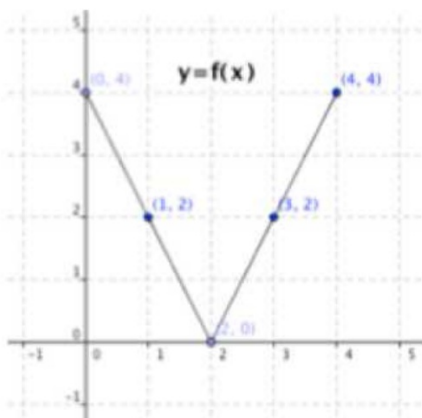
a) $(f \circ g)(2) = 0$

b) $(g \circ f)(3) = 2$



c) $(f \circ f)(1) = 0$

3.3 Notes - WKST



d) $(g \circ g)(3)$

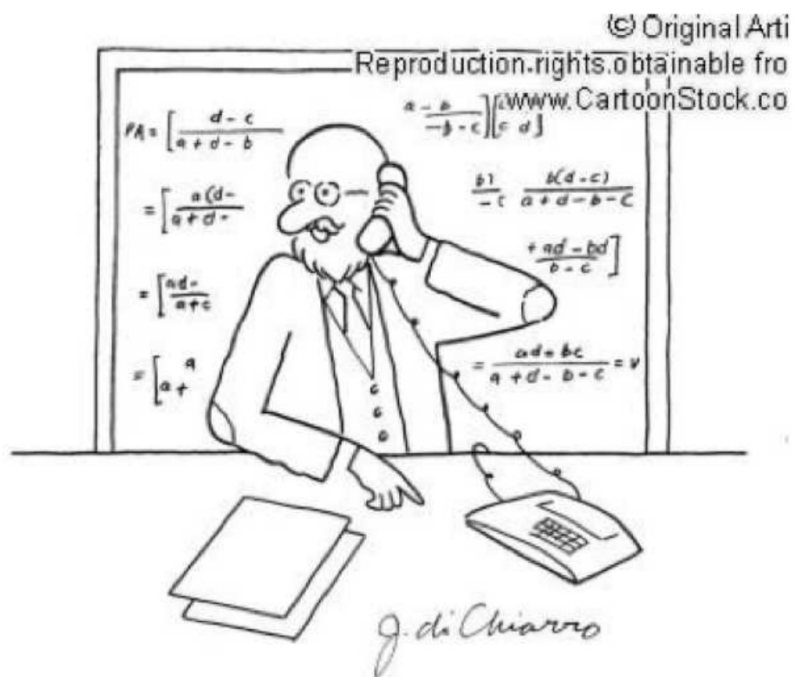
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e) $(f \circ (g \circ f))(1)$

0

3.5 Graphs of Square Roots & Cube Roots



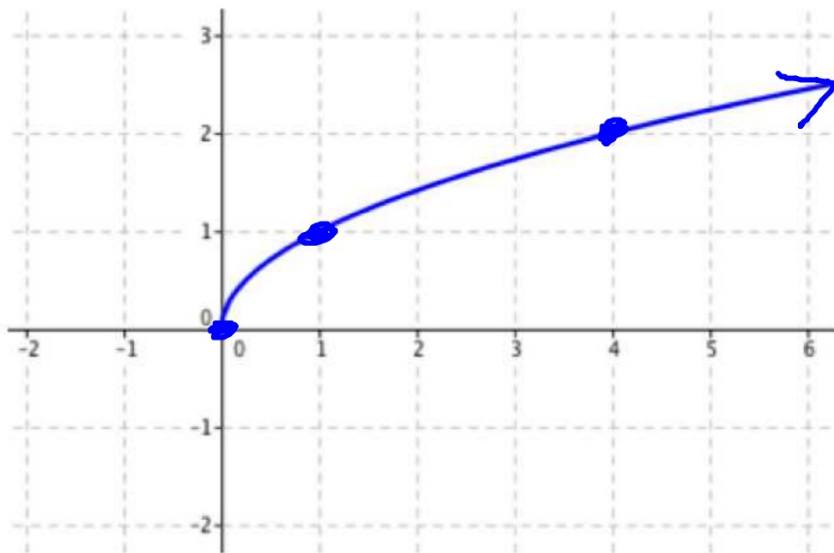
"This is the math department at State U. Send over a pizza that's half pepper, half onion, and half peperoni."

Square Root Graphs

Parent Function: $f(x) = \sqrt{x}$

Graph:

x	y
0	0
1	1
4	2



Domain:

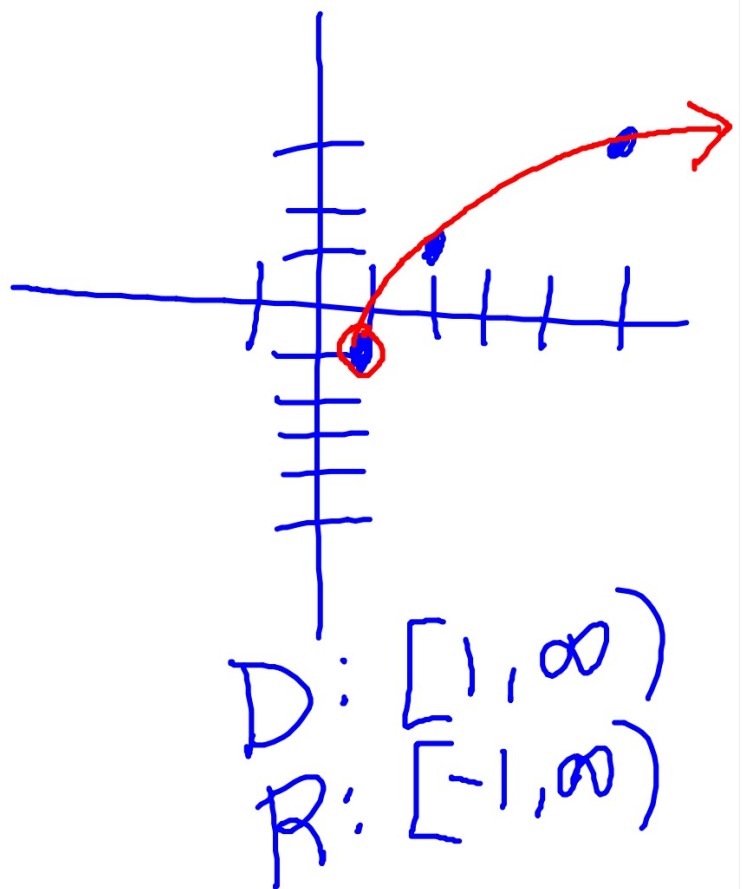
Range:

ex: Sketch and state the domain and range in interval notation.

a) $y = 2\sqrt{x-1} - 1$

Key point:
radicand = 0
 $x - 1 = 0$
 $x = 1$

x	y
1	-1
2	-1
5	3

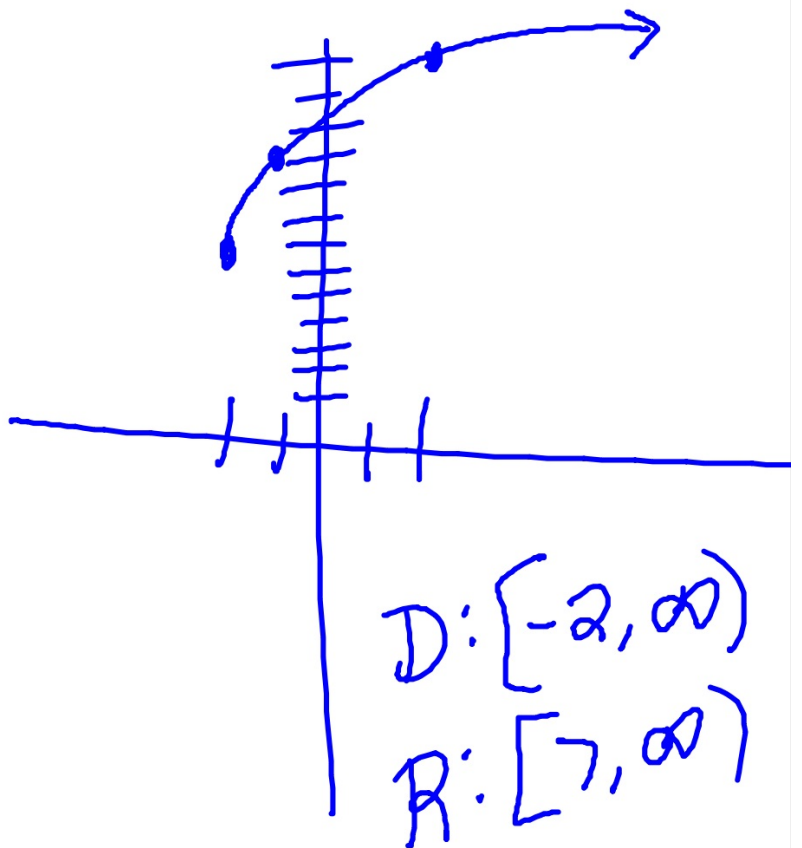


ex: Sketch and state the domain and range in interval notation.

b) $y = 3\sqrt{x+2} + 7$

$$\begin{aligned}x+2 &= 0 \\x &= -2\end{aligned}$$

x	y
-2	7
-1	10
2	13

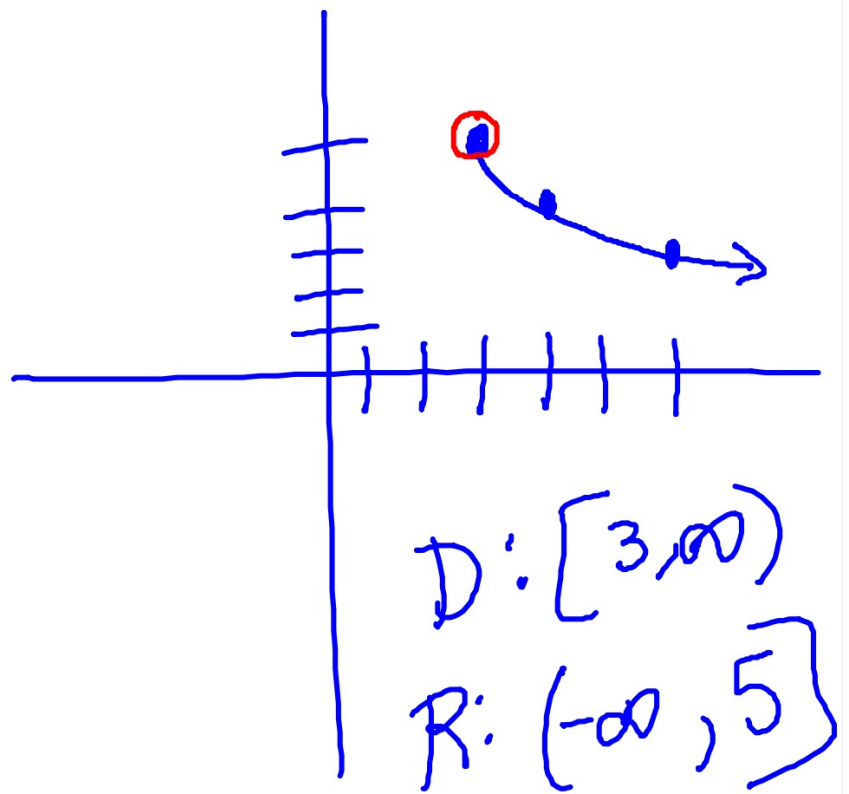


ex: Sketch and state the domain and range in interval notation.

c) $y = -\sqrt{x-3} + 5$

$$x-3=0$$
$$x=3$$

x	y
3	5
4	4
7	3



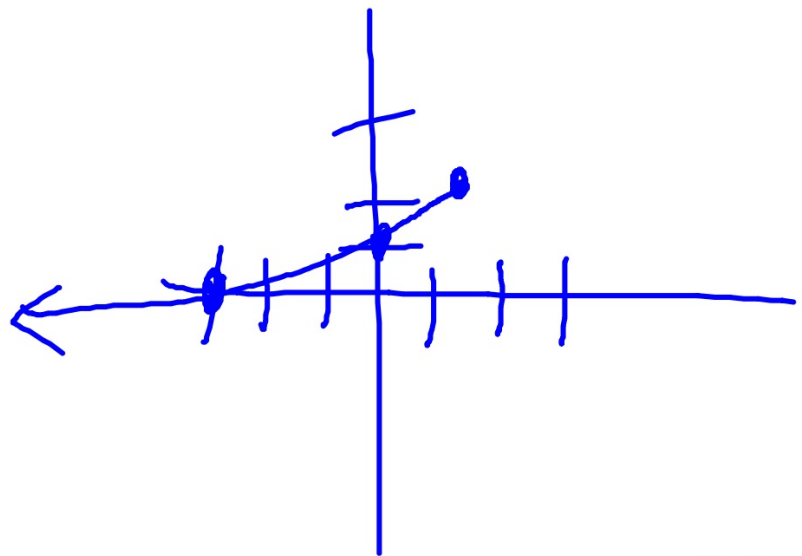
ex: Sketch and state the domain and range in interval notation.

$$2 - \sqrt{1-x}$$

d) $y = 2 - \sqrt{1-x}$

$$1-x=0$$
$$x=1$$

x	y
1	2
0	1
-3	0



$$D: (-\infty, 1]$$

$$R: (-\infty, 2]$$

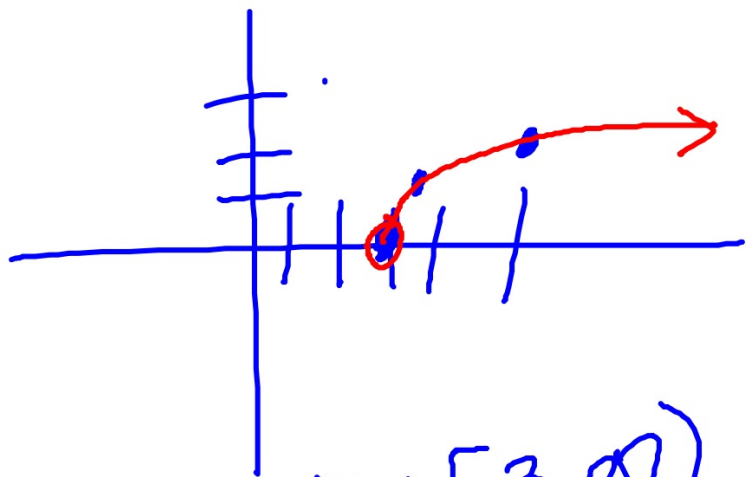
ex: Sketch and state the domain and range in interval notation.

e) ~~$y = \sqrt{3x+1} - 4$~~

$y = \sqrt{2x-6}$

$2x-6=0$
 $x=3$

x	y
3	0
$7/2$	1
5	2

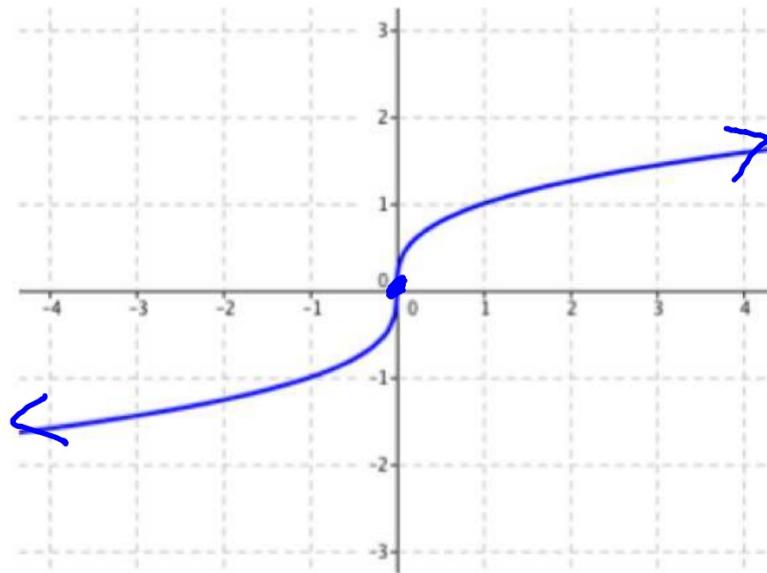


D: $[3, \infty)$
R: $[0, \infty)$

Cube Root Graphs

Parent Function: $f(x) = \sqrt[3]{x}$

Graph:



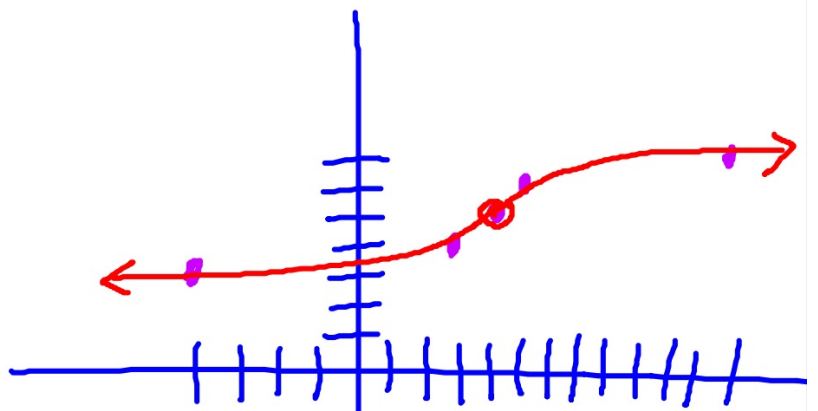
Domain: $(-\infty, \infty)$ Range: $(-\infty, \infty)$

ex: Sketch and state the domain and range in interval notation.

f) $y = \sqrt[3]{x-4} + 5$

Key pt:
 $x = 4$

x	y
-4	3
3	4
4	5
12	7

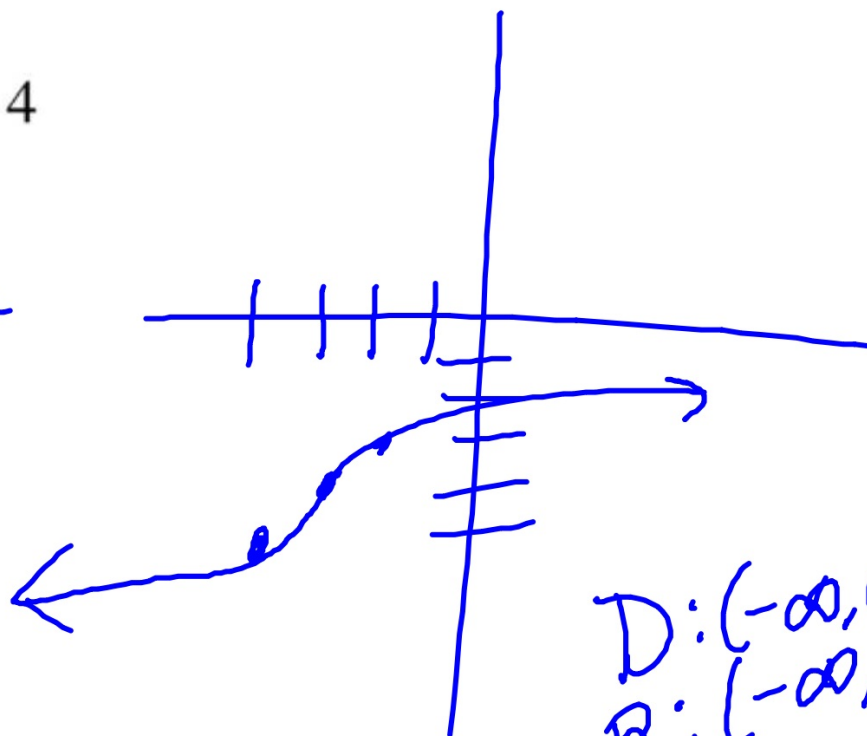


D: $(-\infty, \infty)$
R: $(-\infty, \infty)$

ex: Sketch and state the domain and range in interval notation.

g) $y = \sqrt[3]{x+3} - 4$

x	y
-4	-5
-3	-4
-2	-3



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