Domain and Range Notes

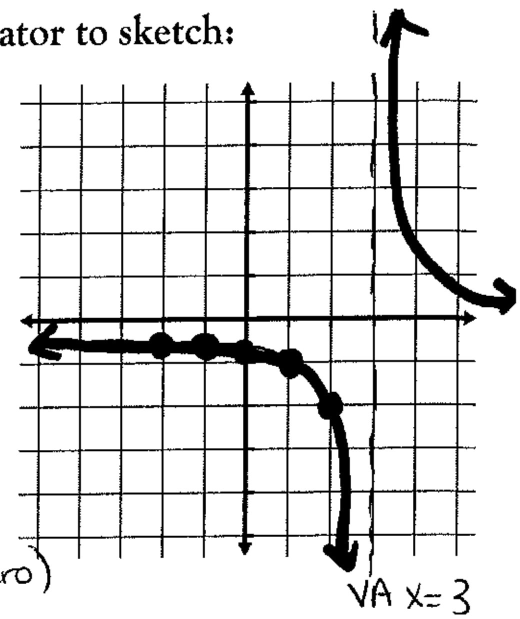
**Domain:** the set of all input values that yield a REAL number output value

- Domain describes the x values that give a <u>real</u> number answer for y

**Fill in the table of values below then use your calculator to sketch:**

$y = \frac{4}{2x-6}$

| x | y |
|---|---|
| -2 | $4/-10 = -2/5$ |
| -1 | $4/-8 = -1/2$ |
| 0 | $4/-6 = -2/3$ |
| 1 | $4/-4 = -1$ |
| 2 | $4/-2 = -2$ |
| 3 | $4/0$ = undefined |




In a fraction, the denominator cannot equal 0 (zero)

**Domain of** $y = \frac{4}{2x-6}$ would be $2x-6 \neq 0$ $\quad (-\infty, 3) \cup (3, \infty)$

$x \neq 3$

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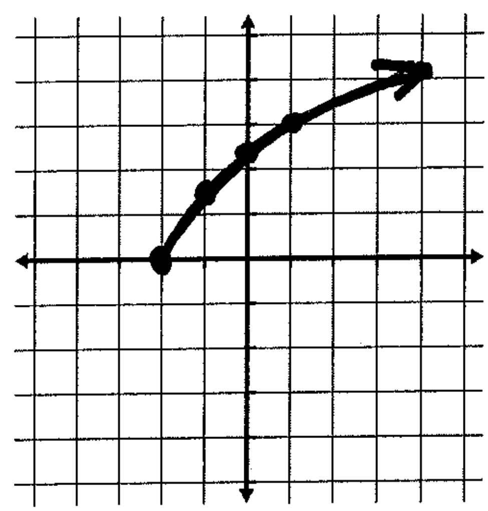
$y = \sqrt{3x+6}$

| x | y |
|---|---|
| -4 | $\sqrt{-6}$ not real |
| -3 | $\sqrt{-3}$ not real |
| -2 | $\sqrt{0} = 0$ |
| -1 | $\sqrt{3}$ |
| 0 | $\sqrt{6}$ |
| 1 | $\sqrt{9} = 3$ |



Under an <u>even</u> radical (square root), the radicand must be greater than or equal to zero

$\geq 0$

Domain of $y = \sqrt{3x+6}$ would be

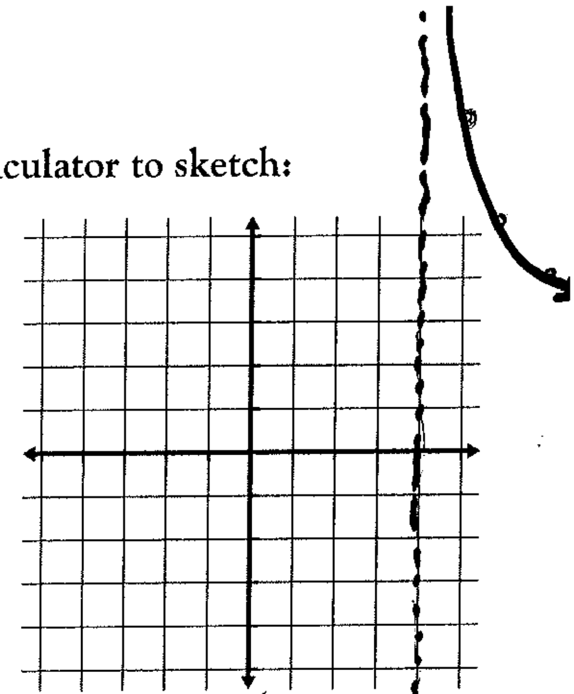
$3x+6 \geq 0 \quad x \geq -2 \quad [-2, \infty)$

Domain and Range Notes

**Fill in the table of values below then use your calculator to sketch:**

$$y = \frac{8}{\sqrt{x-4}}$$

| x | y |
|---|---|
| 2 | $8/\sqrt{-2}$ not real |
| 3 | $8/\sqrt{-1}$ not real |
| 4 | $8/0$ undefined |
| 5 | $8/\sqrt{1} = 8$ |
| 6 | $8/\sqrt{2} \approx 5.65$ |
| 7 | $8/\sqrt{3} \approx 4.62$ |



VA
$x=4$

For this function, there is a fraction, so $x - 4 \neq 0$ why not $= 0$

But, there is also a radical, $x - 4 \geq 0$

If we put these ideas together, then $x - 4 > 0$

**Domain of** $y = \frac{3}{\sqrt{x-4}}$ would be $x - 4 > 0$ so $x > 4$ $(4, \infty)$

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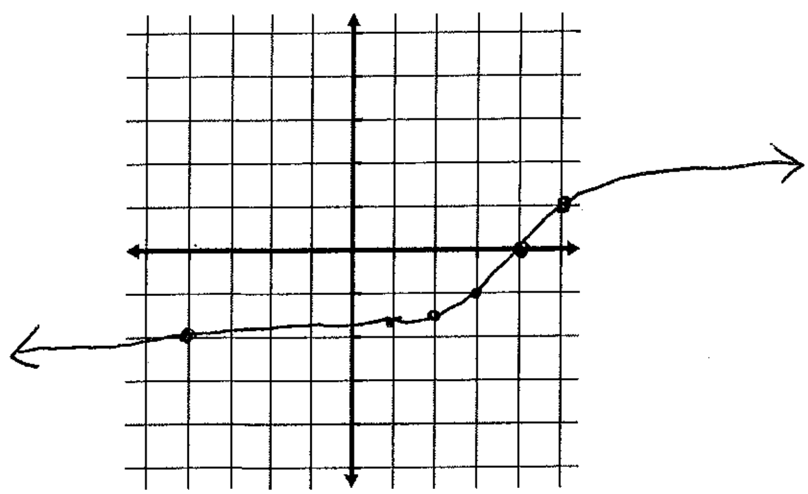
What about $y = \sqrt[3]{x-4}$

| x | y |
|---|---|
| 3 | $\sqrt[3]{-1} = -1$ |
| 4 | $\sqrt[3]{0} = 0$ |
| 5 | $\sqrt[3]{1} = 1$ |



Domain of $y = \sqrt[3]{x-4}$

would be: All Real Numbers!

$\mathbb{R}$ $(-\infty, \infty)$

Domain and Range Notes

**Find the domain of the following functions:**

1. $f(x) = \dfrac{3}{x-2}$

$x - 2 \neq 0$
$x \neq 2$

Domain: $(-\infty, 2) \cup (2, \infty)$

2. $f(x) = \dfrac{3}{x^2 - 9}$

$x^2 - 9 \neq 0$
$(x-3)(x+3) \neq 0$
$x \neq -3, 3$

Domain: $(-\infty, -3) \cup (-3, 3) \cup (3, \infty)$

3. $f(x) = \sqrt{x-4}$

$x - 4 \geq 0$
$x \geq 4$

Domain: $[4, \infty)$

4. $f(x) = \dfrac{5}{\sqrt{x+1}}$

$x + 1 > 0$
$x > -1$

Domain: $(-1, \infty)$

5. $f(x) = \dfrac{3}{x^2+6x+8}$

$x^2 + 6x + 8 \neq 0$
$(x+4)(x+2) \neq 0$
$x \neq -4 \quad x \neq -2$

Domain: $(-\infty, -4) \cup (-4, -2) \cup (-2, \infty)$

6. $f(x) = \dfrac{2x+3}{x^2+9}$

$x^2 + 9 \neq 0$
all real #'s

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

7. $f(x) = |x + 2|$

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

8. $f(x) = \sqrt[3]{x - 4}$

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

Domain and Range Notes

## Domain Review:

In a fraction, the denominator cannot equal zero

Under an even radical, the radicand must be greater than zero

1. $f(x) = \dfrac{3}{8x+4}$ Domain: $(-\infty, -\frac{1}{2}) \cup (-\frac{1}{2}, \infty)$

$8x+4 \neq 0$

$8x \neq -4$

$x \neq -\frac{1}{2}$

2. $f(x) = \sqrt{3x-6}$ Domain: $[2, \infty)$

$3x-6 \geq 0$

$3x \geq 6$

$x \geq 2$

3. $f(x) = \dfrac{8}{\sqrt{x+6}}$ Domain: $(-6, \infty)$

radical in den. no =!

$x+6 > 0$

$x > -6$

4. $f(x) = x^2 + 5x - 6$ Domain: $(-\infty, \infty)$