

# MA 16020 LESSON 21: INTRODUCTION TO FUNCTIONS OF SEVERAL VARIABLES (ALGEBRA REVIEW)

## DOMAIN & RANGE OF SINGLE VARIABLE FUNCTIONS

Recall the following common Domains and Ranges:

- |                 |                                    |                                   |
|-----------------|------------------------------------|-----------------------------------|
| 1. $y = e^x$    | <b>Domain:</b> $(-\infty, \infty)$ | <b>Range:</b> $(0, \infty)$       |
| 2. $y = \ln(x)$ | <b>Domain:</b> $(0, \infty)$       | <b>Range:</b> $(-\infty, \infty)$ |

Note that  $y = e^x$  and  $y = \ln(x)$  are inverses of each other. Which mean the domain of the first function is the range of the second (and vice versa).

- |                      |                                    |                                   |
|----------------------|------------------------------------|-----------------------------------|
| 3. $y = \sqrt{x}$    | <b>Domain:</b> $[0, \infty)$       | <b>Range:</b> $(-\infty, \infty)$ |
| 4. $y = \sqrt[3]{x}$ | <b>Domain:</b> $(-\infty, \infty)$ | <b>Range:</b> $(-\infty, \infty)$ |

Note: Let  $y = \sqrt[n]{x} = x^{1/n}$ .

- If  $n$  is even, then **Domain:**  $[0, \infty)$  **Range:**  $(-\infty, \infty)$
- If  $n$  is odd, then **Domain:**  $(-\infty, \infty)$  **Range:**  $(-\infty, \infty)$

### Techniques for finding the Domain:

- Given  $\sqrt{?}$  then  $? \geq 0$
- Given  $\ln ?$  then  $? > 0$
- Given  $\frac{1}{?}$  then  $? \neq 0$
- Given  $\frac{1}{\sqrt{?}}$  then  $? > 0$

**Exercise 1:** Find the Domain and Range of the following:

1.  $y = \sqrt{2x + 3}$

**Domain:**

**Range:**

2.  $y = \sqrt{x^2 - 1}$

**Domain:**

**Range:**

3.  $y = \ln(x^2 + 2x + 1)$

**Domain:**

**Range:**

4.  $y = \frac{1}{x+4}$

**Domain:**

**Range:**

5.  $y = \frac{1}{\sqrt{5x+1}}$

**Domain:**

**Range:**

6.  $y = \frac{\sqrt{x-1}}{x^2+3x-4}$

**Domain:**

**Range:**

7.  $y = \frac{\sqrt{2x-1}}{\ln(10x-5)}$

**Domain:**

**Range:**

8.  $y = \sqrt[4]{7x + 4}$

**Domain:**

**Range:**

9.  $y = \frac{\ln(x+2)\sqrt[4]{2x+1}}{\sqrt{x-6}}$

**Domain:**

**Range:**