MA 16020 EXAM 3 STUDY GUIDE: ALGEBRA

DOMAIN & RANGE OF SINGLE VARIABLE FUNCTIONS

Recall the following common Domains and Ranges:

1. $y = e^x$ **Domain:** $(-\infty, \infty)$ **Range:** $(0, \infty)$
2. $y = ln(x)$ **Domain:** $(\mathbf{0}, \infty)$ **Range:** $(-\infty, \infty)$

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. $y = \sqrt{x}$ **Domain:** $[\mathbf{0}, \infty)$ **Range:** $(-\infty, \infty)$
4. $y = \sqrt[3]{x}$ **Domain:** $(-\infty, \infty)$ **Range:** $(-\infty, \infty)$

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

- If n is even, then **Domain:** $[\mathbf{0}, \infty)$ **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 $? > 0$

- $(a \pm b)^2 = a^2 \pm 2ab + b^2$
- $a^2 - b^2 = (a+b)(a-b)$
- $x^{-m} = \frac{1}{x^m}$
- $\sqrt[q]{x^p} = x^{p/q}$

Trick to multiply terms

$$h(x) = (2x+1)(3x^2+2x+1) = 6x^3+7x^2+4x+1$$

	$3x^2$	$2x$	1
$2x$	$6x^3$	$4x^2$	$2x$
1	$3x^2$	$2x$	1

$\tan x = \frac{\sin x}{\cos x}$ $\quad \csc x = \frac{1}{\sin x}$

$\cot x = \frac{\cos x}{\sin x}$ $\quad \sec x = \frac{1}{\cos x}$

	0	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$
sin	$\sqrt{0}/2 = 0$	$\sqrt{1}/2$	$\sqrt{2}/2$	$\sqrt{3}/2$	$\sqrt{4}/2 = 1$
cos	$\sqrt{4}/2$	$\sqrt{3}/2$	$\sqrt{2}/2$	$\sqrt{1}/2$	$\sqrt{0}/2 = 0$

$$e^{\ln x} = \exp[\ln x] = x$$

$$\ln[e^x] = x$$