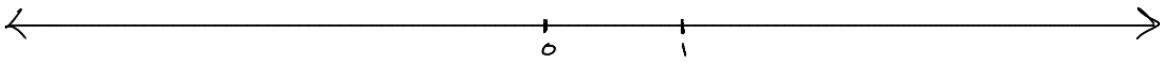
MAI16I – Wk 1 Tuesday
Section 1.1 – 1.2

Real Numbers:



Properties: Exponents (see text)

$5^3 = 5 \cdot 5 \cdot 5$

$x^4 = x \cdot x \cdot x \cdot x$

$(a+b)^3 = (a+b)(a+b)(a+b) \neq a^3 + b^3$ exponents DO NOT play nice with + and -

$(ab)^3 = ab\,ab\,ab = a^3b^3$ exponents play nicely with multiplication & division

Binomial Expansion

$(a+b)^2 = a^2 + 2ab + b^2$

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$(a-b)^4 = a^4 - 4a^3b + 6a^2b^2 + 4ab^3 + b^4$

Pascal's triangle:

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1

Alternate Method:

$(2x-5)^3 = (2x-5)^2(2x-5)$

$= (4x^2 - 20x + 25)(2x-5)$

$= (4x^2 - 20x + 25)\,2x \quad -5(4x^2 - 20x + 25)$

$= 8x^3 - 40x^2 + 50x - 20x^2 + 100x - 125$

$= 8x^3 - 60x^2 + 150x - 125$

Ex $(2x-5)^3 = 8x^3 - 3 \cdot 4x^2 \cdot 5 + 3 \cdot 2x \cdot 25 - 125$
$= 8x^3 - 60x^2 + 150x - 125$

Fractional Exponents

$3^{1/2} = \sqrt{3}$

$a^{m/n} = \sqrt[n]{a^m}$

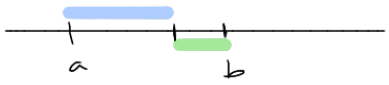
Ex $(5^{3/2})^4 = 5^6$

raise a power to a power …. multiply exponents

Absolute Value

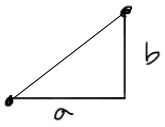
$$|x| = \begin{cases} x & \text{if } x \geq 0 \\ -x & \text{if } x < 0 \end{cases}$$

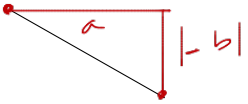
properties: $|ab| = |a||b|$



$|a+b| \leq |a| + |b|$

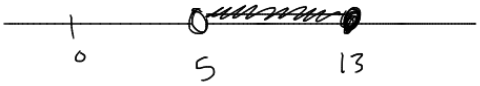
Δ - inequality





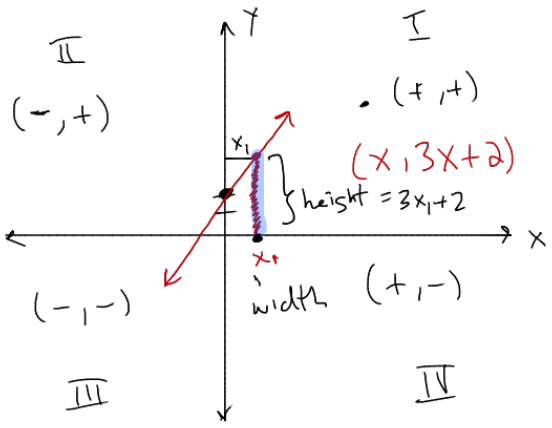
Set Notation:

$(5, 13]$



$\{x \in \mathbb{R} \mid 5 < x \leq 13\}$

"in"

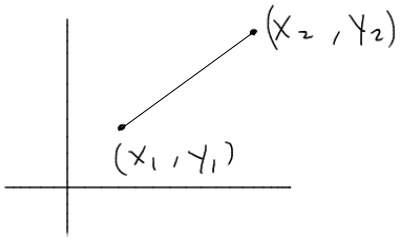


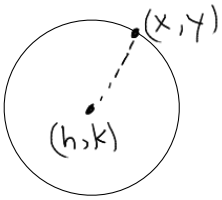
Ex $y = 3x + 2$

Equations distinguish 'cuts out' curves

Distance Formula

$$d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$





radius $= r$

$$r = \sqrt{(x-h)^2 + (y-k)^2}$$

square both sides

$$r^2 = (x-h)^2 + (y-k)^2$$

Functions: Input / Output Machines

$f(x) = 3x^2 + 1$

$f(5) = 3 \cdot 5^2 + 1 = 76$

$f(a) = 3(a)^2 + 1$

$f(x+h) = 3(x+h)^2 + 1 = 3(x^2 + 2xh + h^2) + 1$

Ex $f(x) = 5x + \frac{1}{x^2}$

$f(x+h) = 5(x+h) + \frac{1}{(x+h)^2}$

$f(x+h) - f(x) = 5(x+h) + \frac{1}{(x+h)^2} - \left(5x + \frac{1}{x^2}\right)$

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

Difference Quotient Simplifications

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

compute: $\frac{f(x+h) - f(x)}{h}$

find common denominator, cancel the h in bottom

$= \dfrac{\frac{1}{(x+h)} - \frac{1}{x}}{h}$