Math 17A
Vogler

Pre-Calculus Review

Absolute Value Defn: The absolute value of a real # z is

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

Rule: $\sqrt{z^2} = |z|$

Proportionality

Defn: I) Quantity A is directly proportional to quantity B if $A = kB$ for some constant k.

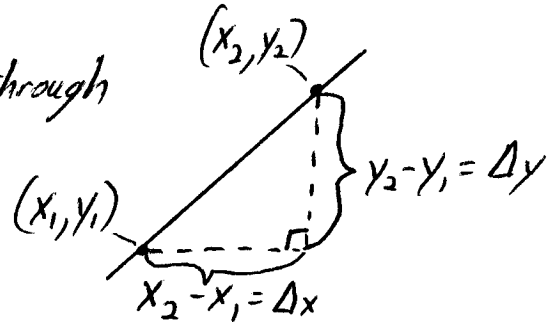
II) Quantity A is inversely proportional to quantity B if $A = k \cdot \frac{1}{B}$ for some constant k.

Note: k is sometimes referred to as a proportionality constant.

Lines

Defn The slope of the line passing through points (x_1, y_1) & (x_2, y_2) is

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{\Delta y}{\Delta x} = \frac{\text{'rise'}}{\text{'run'}}$$



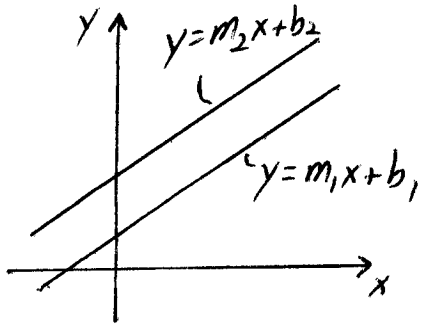
Slope-Intercept Form: $\boxed{y = mx + b}$ is line with slope m & y-intercept b.

Point-Slope Form $\boxed{y - y_1 = m(x - x_1)}$ is line with slope m & passing through point (x_1, y_1)

Parallel Lines

Same slopes

$m_1 = m_2$



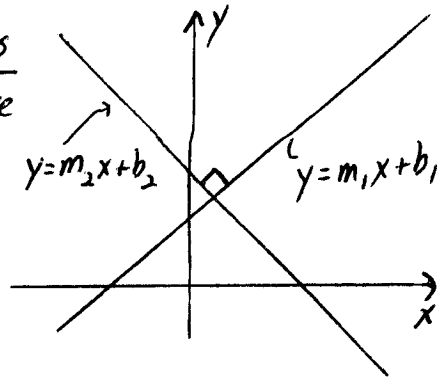
Perpendicular Lines

Slopes are negative reciprocals

$m_1 m_2 = -1$

or

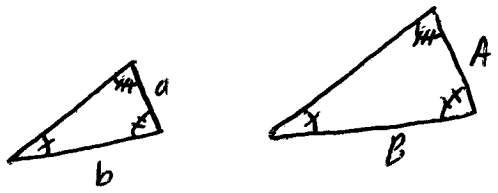
$m_1 = -\frac{1}{m_2}$



Triangles

Similar Triangles

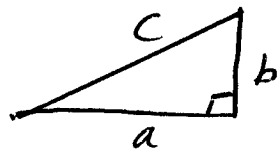
All angles match



$\Rightarrow \quad \frac{A}{B} = \frac{a}{b}$

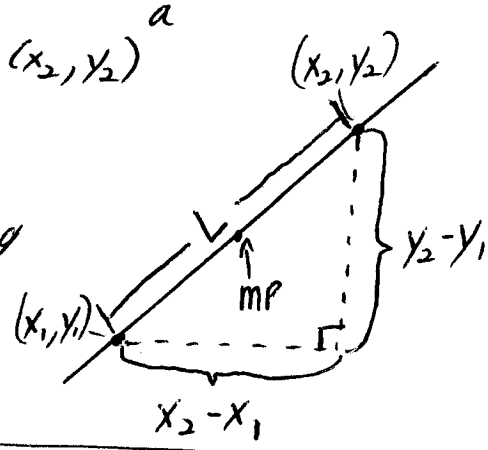
Pythagorean Theorem

$a^2+b^2=c^2$ if & only if the triangle is right



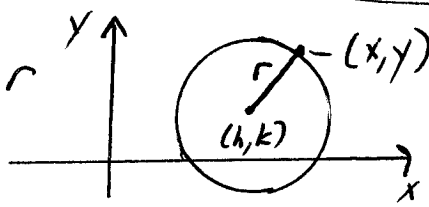
Defn The **distance** between two points (x_1,y_1) & (x_2,y_2) in the xy-plane $L=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

Defn The **midpoint** of the line segment joining points (x_1,y_1) & (x_2,y_2) is $MP=\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$



Circles

Defn The **circle** w/ center (h,k) & radius r is given by $(x-h)^2+(y-k)^2=r^2$



Exponent Rules

1) $(x^m)^n = x^{mn}$
2) $x^m x^n = x^{m+n}$
3) $\frac{x^m}{x^n} = x^{m-n}$
4) $(xy)^m = x^m y^m$
5) $\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}$
6) $x^{-m} = \frac{1}{x^m}$

Logarithms

Defn $\log_b x = m$ means $b^m = x$

Rules 1) $\log_b(mn) = \log_b m + \log_b n$
2) $\log_b\left(\frac{m}{n}\right) = \log_b m - \log_b n$
3) $\log_b m^n = n \log_b m$
4) $\log_b b^x = x$
5) ~~b log~~ $b^{\log_b x} = x$

Notation 1) $\ln x = \log_e x$ with $e \approx 2.71828$
2) $\log x = \log_{10} x$

Complex Numbers

Defn I) $i := \sqrt{-1}$
II) $a+bi$ is the **general form of a complex number** (a,b are real #s)

Note: $i^2=-1$, $i^3=-i$, $i^4=1$, $i^5=i$, ...