9/19/17 FOILING vs DISTRIBUTING

$(5x+3)(x+4) = 5x^2+20x+3x+12$

$(x+1)(x^2+3x+4) = x^3+3x^2+4x$

$x^2+3x+4$

$= x^3+4x^2+7x+4$

$3(x+1) = 3x+3$

★ $(2x+1)^2 = (2x+1)(2x+1)$

$4x^2+1 \neq 4x^2+4x+1$

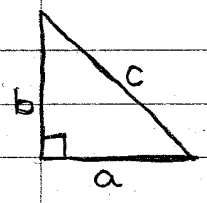
$(AB)^2 = ABAB$

$A^2B^2$

TRIG: 

## SPECIAL TRIANGLES

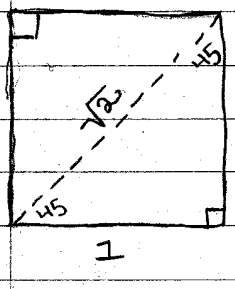
$a^2+b^2=c^2$ <=> Right triangle




$3^2+4^2 = 9+16 = 25 = 5^2$

Pythagorean Triples

(5, 12, 13)



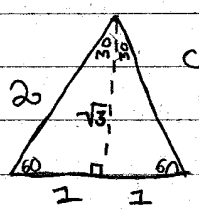

$90° + 2\alpha = 180$

$2\alpha = 90$

$\alpha = 45°$

ex) $2, \sqrt{2}, \sqrt{2}$

↳ is a 45/45/90 Δ because Pythagorean theorum works, + Common multiple = $\sqrt{2}$



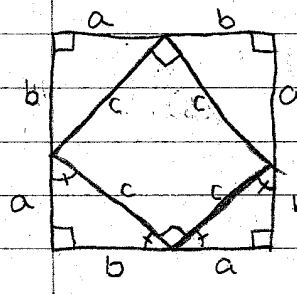

$c^2 = a^2+b^2$

$4 = 1+b^2$

$3 = b^2$

ex) 3, 4, 5

## P. T. PROOF:




Area of Big □ = $(a+b)^2 = (a+b)(a+b) = a^2+2ab+b^2$

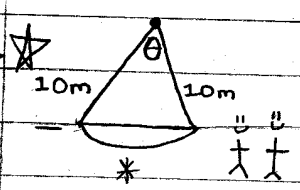
Area of 4 Δs = $4(\frac{1}{2}ab)$

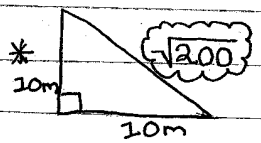
Area of Small □ = $c^2$

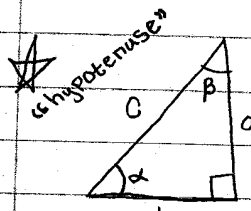
$a^2+2ab+b^2 = 2ab+c^2$

$a^2+b^2 = c^2$

# TRIG NOTES

9/20/17 → 


$\sin(\alpha) = \frac{a}{c} \rightarrow {}^{opp}/_{hyp}$

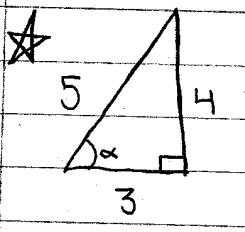
$\cos(\alpha) = \frac{b}{c} \rightarrow {}^{adj}/_{hyp}$

$\cos(\beta) = \sin(\alpha)$

$\tan(\alpha) = \frac{a}{b} \rightarrow {}^{opp}/_{adj}$

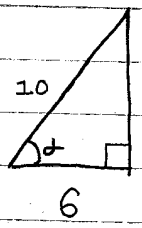
$\tan(\alpha) = \sin(\alpha)/\cos(\alpha)$

$\frac{a/c}{b/c} = {}^{a}/_{b}$ → tangent

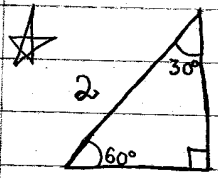



$\sin(\alpha) = {}^{4}/_{5}$

$\cos(\alpha) = {}^{3}/_{5}$




$\sin(\alpha) = \frac{8}{10} = {}^{4}/_{5}$




$\sin(60) = {}^{\sqrt{3}}/_{2}$

$\sin(30) = {}^{1}/_{2}$

$\cos(60) = {}^{1}/_{2}$

$\cos(30) = {}^{\sqrt{3}}/_{2}$

★ $(\sin(\alpha))^2 = \sin^2(\alpha)$

① $\sin^2(60) = {}^{3}/_{4}$

$\cos^2(60) = {}^{1}/_{4}$

$\sin^2(60) + \cos^2(60) = 1$

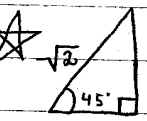
$\sin^2(\alpha) = {}^{a}/_{c} \rightsquigarrow {}^{a^2}/_{c^2}$

$\cos^2(\alpha) = {}^{b}/_{c} \rightsquigarrow {}^{b^2}/_{c^2}$

② $\sin^2(\alpha) = {}^{a^2}/_{c^2}$

$\cos^2(\alpha) = {}^{b^2}/_{c^2}$

$\frac{a^2+b^2}{c^2} = {}^{c^2}/_{c^2} = 1$




$\sin^2(45) = {}^{1}/_{2}$

$\cos^2(45) = {}^{1}/_{2}$

★ $\alpha < 90°$ → acute

$\alpha = 90°$ → right

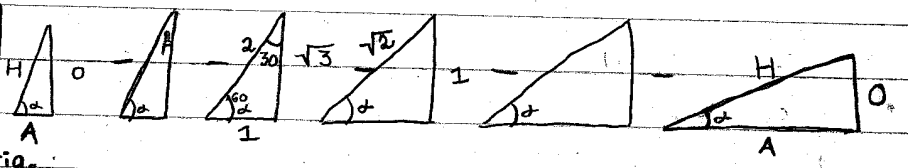
$\alpha > 90°$ → Obtuse

9/22/17 → SOH-CAH-TOA

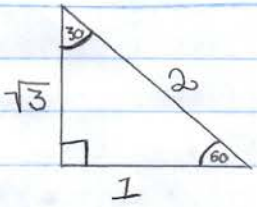
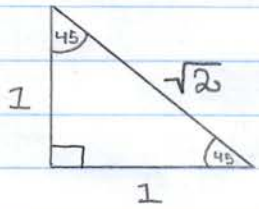
$\sin(90) = 1$ | $\sin(0) = 0$

$\cos(90) = 0$ | $\cos(0) = 1$

Hipparchus → Father of Trig.



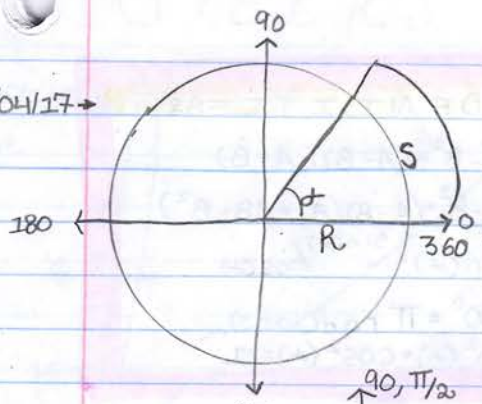
## Cosines & Sines of Special triangles

| TRIANGLE | COSINE ($^{adj}/_{hyp}$) | SINE ($^{opp}/_{hyp}$) |
|---|---|---|
|   | $\cos(30) = \sqrt{3}/2$ | $\sin(30) = 1/2$ |
| | $\cos(60) = 1/2$ | $\sin(60) = \sqrt{3}/2$ |
| | $\cos(90) = 0$ | $\sin(90) = 1$ |
|   | $\cos(45) = 1/\sqrt{2}$ | $\sin(45) = 1/\sqrt{2}$ |
| | $\cos(90) = 0$ | $\sin(90) = 1$ |
| it is not possible to draw a triangle with a zero degree angle measure. | $\cos(0) = 1$ | $\sin(0) = 0$ |

9/30/17→

| Sin | Cos | tan | Sec | cot | csc |
|---|---|---|---|---|---|
| o/h | a/h | o/a | h/a | a/o | h/o |
| leg/hypo | leg/hypo | leg/leg | hypo/leg | leg/leg | hypo/leg |
| | | | 1/cos | 1/tan | 1/Sin |
| SINE | COSINE | TANGENT | SECANT | COTANGENT | COSECANT |

10/04/17

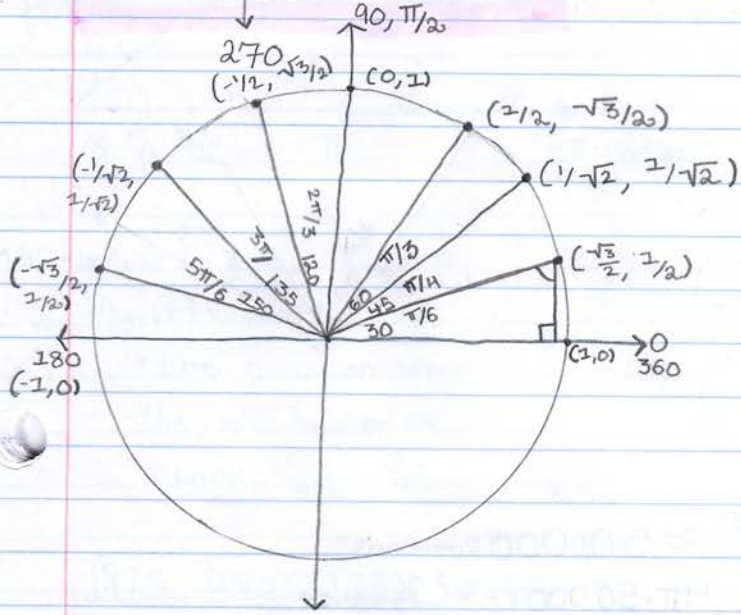



$\theta = S/R$

$180° = \pi$ Rad

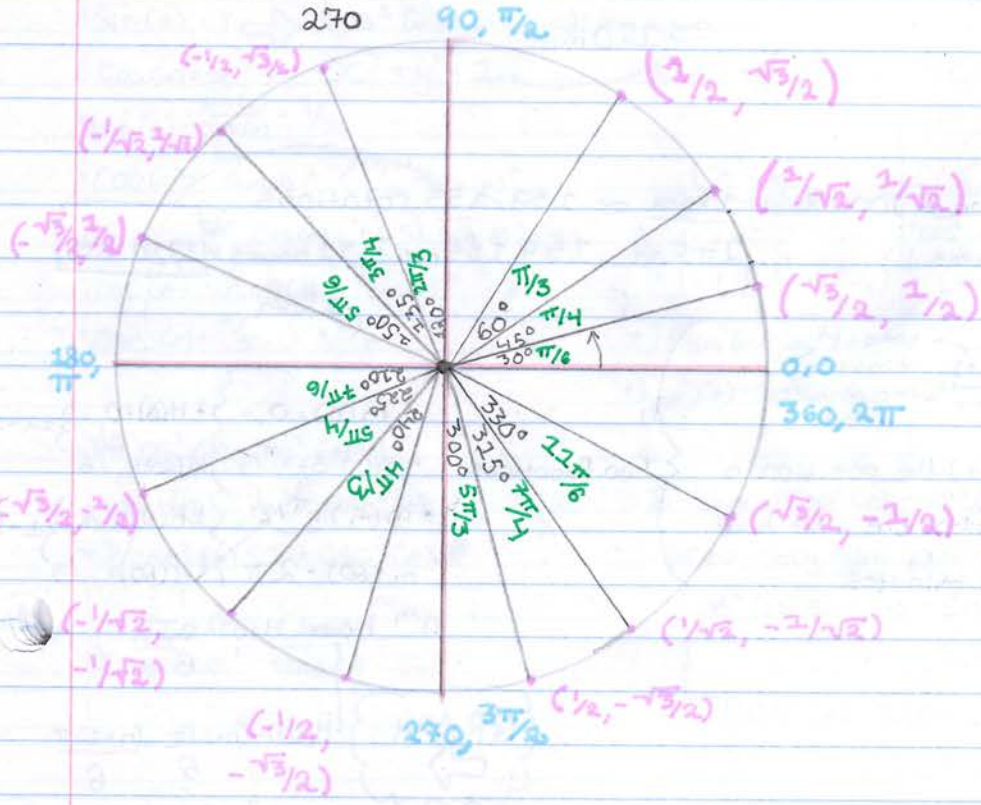
$180/\pi$ degrees = 1 Radian

7 radian $\cdot$ $180/\pi = 1260/\pi = 401.07$




$\frac{120}{1} \cdot \frac{\pi}{180} = \frac{2}{3}\pi$

$\frac{130\pi}{180} = \frac{5\pi}{6}$



10/11/17 → Homework Question°

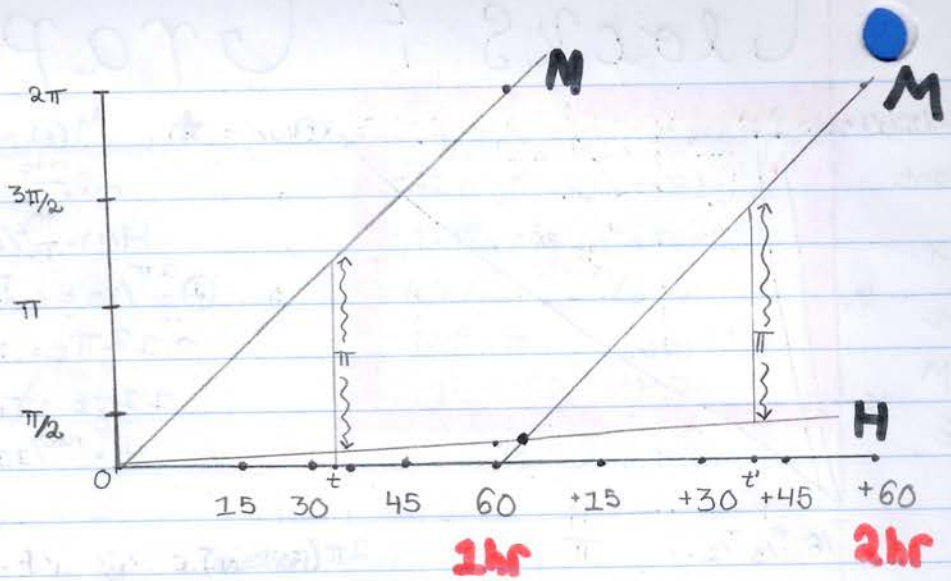
$\frac{2\pi}{60} = \frac{\pi}{360}t + \pi$

$\frac{360\times 2}{60}t = t + 360$

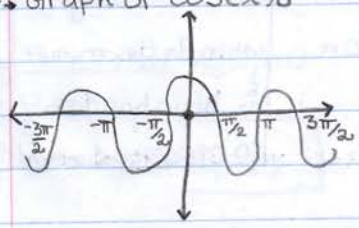
$12t = t + 360$

$11t = 360$

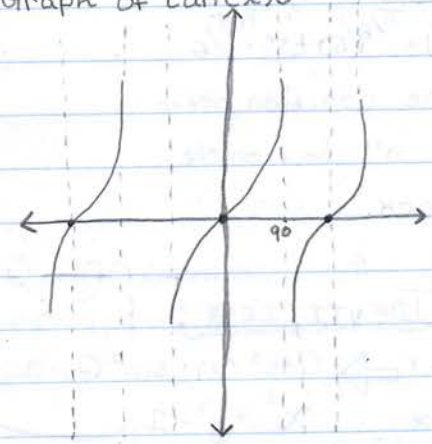
$t = {}^{360}/_{11} \approx 32.7$ minutes




10/12/17 → Graph of cos(x)°




Graph of tan(x)°




10/13/17 → $H(t) = \frac{\pi}{360}t + \frac{n\pi}{6}$

$M(t) = \frac{2\pi}{60}\pi$

So, when will $H(t) - M(t) = \pi$?

$\frac{\pi}{360}t + \frac{n\pi}{6} - \frac{2\pi}{60}t = \pi$

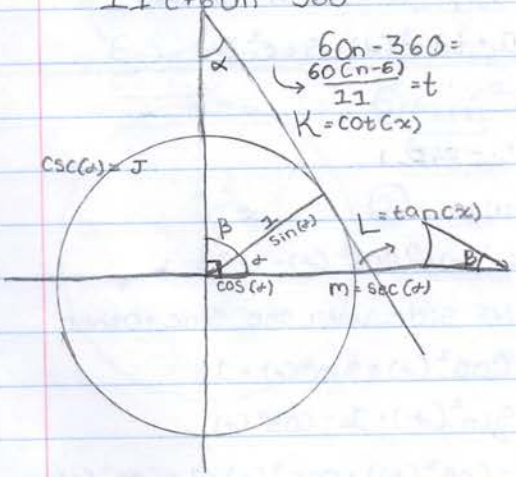
$\pi t + 60\pi n - 12\pi t = 360\pi$

$-11t + 60n = 360$

$60n - 360 =$

$\frac{60(n-6)}{11} = t$

$K = \cot(x)$




$\tan(\alpha) = L$

$\cos(\alpha) = \frac{1}{m}$, $m = \sec(\alpha)$

$\tan(\alpha) = {}^{1}/_{K}$, $K = \cot(\alpha)$

$\sin(\alpha) = {}^{1}/_{J}$, $J = \csc(\alpha)$

$\cos^2\alpha + \sin^2\alpha = 1$

$1 + L^2 = m^2$

$1 + \tan^2\alpha = \sec^2\alpha$

$1 + \cot^2\alpha = \csc^2\alpha$

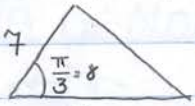
# Functions

11/29/17 → DOMAIN → FUNCTION → RANGE

x-values | y-values

*angle/input ≠ ratio. ↳ output

- Review Sheet #3 ✓




A(S, A, S) = 1/2 · a · b · sin θ

↳ triangle congruence

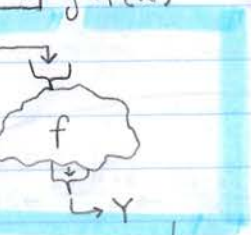
↳ inputs

- functions need to be "well-defined"
  ↳ For every input, there is exactly one output.

12/1/17 → Euler → FUNCTIONS

- Switzerland ↳ $e^{i\pi}+1=0$
- 1707 - 1783
- Pastor? 5/13
- St. Petersburg
- Berlin academy
- Fred II → cyclops (1 blind)
- Most prolific
- Brain hemmorage → death

12/5/17 → $y = f(x)$

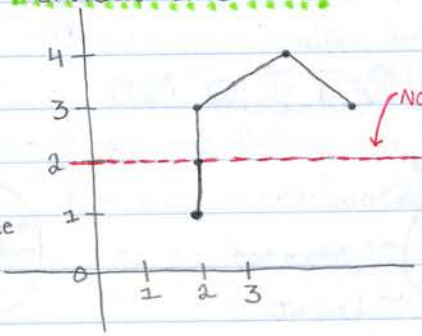




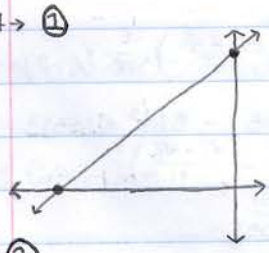
↳ NOT FUNCTION

FUNCTION: every input has exactly one output.

↳ Vertical line test




12/5/17 → ①




②

$y = ax^2 + bx + c$

$y = 2(x^2) + 5x + 3$

x-coordinate of vertex → $x = -b/2a = -5/4$ → $y = a(-b/2a)^2 - b^2/2a + c$

$2(-5/4)^2 - 25/4 + 3$ $\quad y = b^2/4a - 2b^2/4a + 4ac/4a =$

$+\frac{25}{8} - \frac{50}{8} + \frac{24}{8} = -1/8.$ $\quad -\frac{b^2+4ac}{4a}$ ↳ y-coordinate of vertex

# Functions ⇨ EVEN or ODD

Lucy 12/12/17

12/12/17 cont.

| | $x$ | $x^2$ | $x^3$ | $x^4$ | $x^5$ | $x^6$ | $x^{odd}$ | $x^{even}$ |
|---|---|---|---|---|---|---|---|---|
| $-2$ | $-2$ | $4$ | $-8$ | $16$ | $-32$ | $64$ | $-2^{odd}$ | $2^{even}$ |
| $-1$ | $-1$ | $1$ | $-1$ | $1$ | $-1$ | $1$ | $-1$ | $1$ |
| $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ | $0$ |
| $1$ | $1$ | $1$ | $1$ | $1$ | $1$ | $1$ | $1$ | $1$ |
| $2$ | $2$ | $4$ | $8$ | $16$ | $32$ | $64$ | $2^{odd}$ | $2^{even}$ |

* even function: $f(-x) = f(x)$
* odd function: $f(-x) = -f(x)$
* $f(x) = x^3 \rightarrow f(-1) = (-1)^3 = -1$
  $\rightarrow f(1) = 1^3 = 1$

* $\cos(x)$ is even
* $\sin(x)$ is odd
* $\tan(x)$ is odd

* ① $\cos(-x) = \cos(x)$
  $\cos(-45) = 1/\sqrt{2}$
  $\sin(-45) = -1/\sqrt{2}$
* ② $\tan(x)$ is odd
  $\tan(-x) = \frac{\sin(-x)}{\cos(-x)}$
  $= \frac{-\sin(x)}{\cos(x)} = -\tan(x)$

12/13/17 → $f(x) = \frac{x^3 - 5x}{\sqrt{1+x^2}}$ (odd / even) → PLUG IN $(-x)$ → $f(-x) = \frac{(-x)^3 - 5(-x)}{\sqrt{1+(-x)^2}} \rightarrow \frac{-x^3 + 5x}{\sqrt{1+x^2}} \rightarrow$

→ factor out a negative: $\frac{-(x^3 - 5x)}{\sqrt{1+x^2}}$

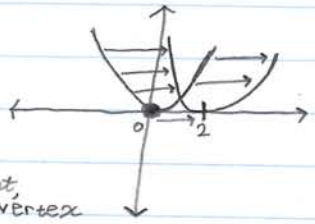
- $f(-x) = -f(x) \rightarrow$ ODD
  $= f(x) \rightarrow$ EVEN
  $= ? \rightarrow$ NEITHER

$f(x) = x^2$ & $g(x) = (x-2)^2 \rightarrow g(x) = f(x-2)$

Possible Transformation Descriptions:

① graph move 2 to the right
② Domain 2 to left

} BOTH, equivalent, moving vertex or axis.
↳ Matter of perspective.




$f(x) = x^2$ & $g(x) = f(2x) \rightarrow g(x) = (2x)^2$

① Domain narrows by a factor of 2.
② Graph.