Algebra II EOC Review

Day 1

$\boxed{\text{Complex Numbers}}$

① Standard form: $a + bi$
(real) (complex)

② Complex conjugate: $a - bi$ (sign in front of the i changes)

③ Always come in pairs: $a+bi \to a-bi$, $bi \to -bi$

④ $i = \sqrt{-1}$ or $i^2 = -1$

⑤ Add / Subtract / Multiply: treat i like a variable and $i^2 = -1$
(Distribute, FOIL, etc.)

⑥ Dividing: Rationalize the denominator
* Multiply the NUMERATOR and DENOMINATOR by the COMPLEX CONJUGATE of DENOMINATOR.

$\boxed{\text{EXAMPLES}}$ #1, 3 # 6, 7, 8 # 12, 10, 13

$\boxed{\text{Composite Functions}}$

① $f(x)$ is a function f that depends on x. [plug in x-value into eq]

Ex: $f(x) = 3x^2 - 1$; $f(2) = 3(2)^2 + 1$
$x = 2$

② $(f \circ g)(x) = f(g(x))$ is a composite function f that depends on $g(x)$.
[plug in $g(x)$ for x in the $f(x)$ equation

Ex: $f(x) = x^2 + 2$
$g(x) = \sqrt{x-5}$

a.) $(f \circ g)(x)$

$f(g(x))$
function f, plug in g

$x^2 + 2$

$[g(x)]^2 + 2$

$[\sqrt{x-5}]^2 + 2$

$x - 5 + 2$

$x - 3$

b.) $g(f(x))$
function, plug in

$\sqrt{x-5}$

$\sqrt{f(x)-5}$

$\sqrt{x^2+2-5}$

$\sqrt{x^2-3}$

EXAMPLES # 15, 17

Algebra II EOC Review

Day 2

Absolute Value Inequalities *Always isolate $|x|$

① OR ($>$ or $\geq$)

A.) Solving $|x| > a$

Case 1	Case 2
$x > a$	$x < -a$

Flip ineq, Flip sign

B.) Number Line

C.) Interval Notation $(-\infty, -a) \cup (a, \infty)$

D.) Inequality Notation $\{x \mid x < -a \text{ or } x > a\}$

* Includes solutions for EITHER

2. AND ($<$ or $\leq$)

A.) Solving $|x| \leq a$

Case 1	Case 2
$x \leq a$	$x \geq -a$

Flip Flip

B.) Number Line

C.) Interval Notation $[-a, a]$

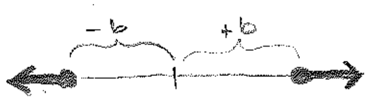
D.) Inequality Notation $\{x \mid -a \leq x \leq a\}$

* Includes solutions for BOTH

② Meaning of an Absolute Value Inequality

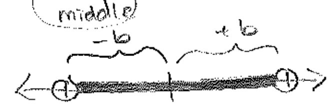
A.) $|x - a| \geq b$ (OR)

+a middle, (OR), ±b



B.) $|x + a| > b$ (AND)

-a middle, (AND), (± b)



EXAMPLES # 2, 3, 10 # 11, 13

Systems of Equations: Three Variables

① Create a Matrix: $\boxed{2^{nd}}$ + $\boxed{x^{-1}}$ (matrix) + $\boxed{\rightarrow}$ x2 (Edit) + $\boxed{\text{Enter}}$ — 3 row x 4 column

② Enter Matrix: Use #9 on EOC Review

$$3a + 4b + c = 5$$
$$a - 6b + 2c = 14$$
$$\tfrac{1}{2}a - 2b + \tfrac{1}{3}c = 4$$

$$\rightarrow \left[\begin{array}{ccc|c} 3 & 4 & 1 & 5 \\ 1 & -6 & 2 & 14 \\ 1/2 & -2 & 1/3 & 4 \end{array}\right]$$

+ $\boxed{2^{nd}}$ + $\boxed{\text{Mode}}$ (Quit)

③ Solve: $\boxed{2^{nd}}$ + $\boxed{x^{-1}}$ (matrix) + $\boxed{\rightarrow}$ (math) + $\boxed{\downarrow}$ x11 (rref) + $\boxed{\text{Enter}}$

$\boxed{2^{nd}}$ + $\boxed{x^{-1}}$ (matrix + Find matrix $\boxed{\text{Enter}}$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 3 \end{array}\right]$$

a = 2
b = -1
c = 3

EXAMPLES # 21

Algebra II EOC Review

Day 3

Linear Inequalities

① Write equations in slope intercept form: $y = mx + b$ — m = slope, b = y intercept

② Line type: Solid for $\geq$ and $\leq$ ———
Dashed for $>$ and $<$ - - - -

③ Shaded Area: Below for $y <$ and $y \leq$
Above for $y >$ and $y \geq$

Hint: Almost Always is a triangular/rectangular Area.

④ Other: Plug in coordinate points to test inequality

Examples #1, 3, 4, 7

Linear Programming

① Define Variables: What are you trying to minimize/maximize (last sentence usually)?

② Write Objective Function: Multiply variable by cost/profit.

③ Write all constraints (inequalities): What is being limited? (time, resources, people, etc.)

④ Plug in given values of MC, which gives min/max?

⑤ Check answer: Plug #4 into all #3's. Is it true? If not pick the next min/max in #4.

★ Unless it's a quick graph, dont graph b/c it takes too much time.

Examples #2, 6, 8, 10, 11, 14

Algebra II EOC Review

Day 4

Quadratic Equations

(1) Always put in Standard Form: $ax^2 + bx + c = 0$

A.) Factor: Factors $a \cdot c$ that sum up to b (quick but only works sometimes)

B.) Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ (longer but works always) * on equation sheet

C.) Discriminant: $\pm \sqrt{b^2 - 4ac}$

(i) $b^2 - 4ac > 0$ $[\pm\sqrt{+}]$ 2 real solutions

(ii) $b^2 - 4ac = 0$ $[\pm\sqrt{0}]$ 1 real solution

(iii) $b^2 - 4ac < 0$ $[\pm\sqrt{-}]$ 2 imaginary/complex solutions

i

(2) Inequalities: Solve, put on # line, test pts.

(3) Other: Plug in answers in MC. Do they $= 0$?

EXAMPLES # 1, 2, 3, 4, 5, 8, 9, 11, 12

Algebra II EOC Review

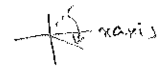
Day 5

$\boxed{\text{Graph Transformations}}$ * Vertical (outside x) AND Horizontal (inside w/ x)

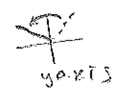
① Shifts: A. Horizontal shift (w/ x): $y = f(x \pm a)$ — $+a$ shift Left a units; $-a$ shift Right a units

B. Vertical shift (outside x): $y = f(x) \pm b$ — $+b$ shift Up b units; $-b$ shift Down b units

② Reflections: A. Vertical $\left(\begin{smallmatrix}\text{across}\\ x\text{-axis}\end{smallmatrix}\right)$: $y = -f(x)$ flip up/down



B. Horizontal $\left(\begin{smallmatrix}\text{across}\\ y\text{-axis}\end{smallmatrix}\right)$: $y = f(-x)$ flip left/right



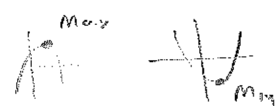
③ Stretches: A. Vertical: $y = k\,f(x)$ — $k > 1$ stretch vertically; $0 < k < 1$ compress vertically

B. Horizontal: $y = f(kx)$ — $k > 1$ compress horizontally; $0 < k < 1$ stretch horizontally

$\boxed{\text{EXAMPLES}}$ # 6, 7, 8, 9, 10

$\boxed{\text{Quadratic Graphs:}}$

① Vertex: Min/Max Point



A.) Vertex Form: $y = (x-h)^2 + k$ vertex: (h, k)

B.) Standard Form: $y = ax^2 + bx + c$ Vertex: $x = \frac{-b}{2a}$

$y \rightarrow$ plug in x value

* $+a$ open up / $-a$ open down
min max

② Domain: All reals; $(-\infty, \infty)$; $-\infty < x < \infty$

Range: if $a > 0$ (open up) $y \geq k$

if $a < 0$ (open down) $y \leq k$

③ Other: Calculator

Type equation into $\boxed{y=}$.

→ Find min/max [vertex] using $\boxed{2^{nd}}$ + $\boxed{\text{Trace}}$ → $\boxed{3}$ (min) or $\boxed{4}$ (max)

→ Find shifts/reflections.

$\boxed{\text{EXAMPLES}}$ # 1, 2, 3, BACK

Quadratic Inequalities

① ax^2+bx+c is a parabola
$mx+b$ is a line

② Shade Above: $y >$ or $y \geq$
Shade Below: $y <$ or $y \leq$

③ $+a$ parabola opens down
$-a$ parabola opens up

EXAMPLES # 12, 13, 14

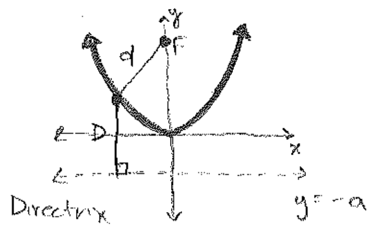
Algebra II EOC Review

Day 6

Conic Sections

a.) Parabola - one of the variables is square, the other is not

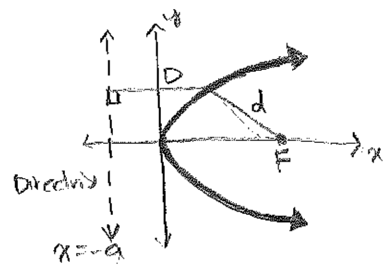
i) Verticle Parabola ($y=x^2$)



D = d.

- $y = a(x-h)^2 + k$ $-a$ open down, $+a$ open up
- (h,k) vertex w/ $x=h$ axis symmetry
- Directrix: $y = k - \frac{1}{4a}$
- Focus (F): $(h, k + \frac{1}{4a})$

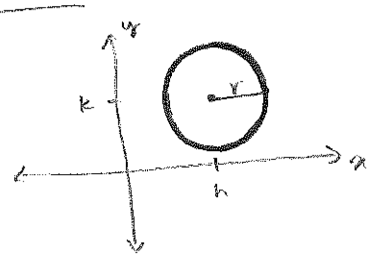
ii) Horizontal Parabola ($x=y^2$)



D = d

- $x = a(y-k)^2 + h$ $-a$ open left, $+a$ open right
- (h,k) vertex w/ $y=k$ axis of symmetry
- Directrix: $x = h - \frac{1}{4a}$
- focus: $(h + \frac{1}{4a}, k)$

b.) Circles - both variables squared w/ no fractions. (x^2+y^2)



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

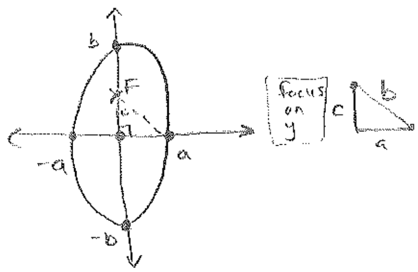
$x^2 + y^2 = r^2$ center: $(0,0)$

★ Note: $x-h$ and $y-k$ correspond to $(+h, +k)$

$x+h$ and $y+k$ correspond to $(-h, -k)$

c.) Ellipse - both variables are squared w/ fractions added $\left(\frac{x^2}{a}+\frac{y^2}{b}=1\right)$ and equal to 1.

i) Verticle (where $b>a$)

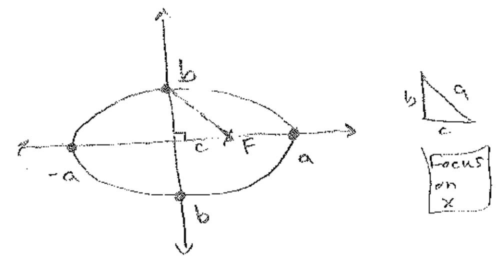


- $\dfrac{(x-h)^2}{a^2}+\dfrac{(y-k)^2}{b^2}=1$

  a^2 ↑ semi major axis; b^2 ↑ major axis

- center: (h,k)
- foci: $(h, k\pm c)$ where $c^2 = b^2 - a^2$

ii) Horizontal (where $a>b$)



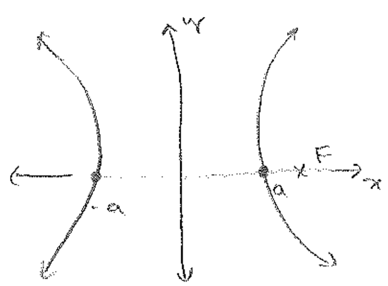
- $\dfrac{(x-h)^2}{a^2}+\dfrac{(y-k)^2}{b^2}=1$

  a^2 ↑ major; b^2 ↑ semi major axis

- center: (h,k)
- foci $(h\pm c, k)$ where $c^2 = a^2 - b^2$

d.) Hyperbela - both variable are squared w/ fractions subtracted $\left(\frac{x^2}{a}-\frac{y^2}{b}=1\right)$ and equal to 1

i) Verticle (pay attention to order)

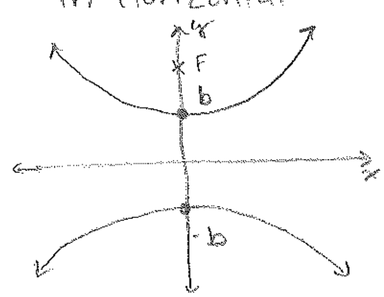


- $\dfrac{(x-h)^2}{a^2}-\dfrac{(y-k)^2}{b^2}=1$

  a^2 ↑ in front on negative = move on horizontal

- Center: (h,k)
- foci: $(h\pm c, k)$ where $c^2 = a^2 + b^2$

ii) Horizontal (order)



- $\dfrac{(y-k)^2}{b^2}-\dfrac{(x-h)^2}{a^2}=1$

  b^2 ↑ same

- center: (h,k)
- foci: $(h, k\pm c)$ where $c^2 = a^2 + b^2$

Algebra II EOC Review

Day 7

$\boxed{\text{Polynomials}}$

① <u>Adding / Subtracting</u> - combine "like terms" by add/sub coefficients + keep variable

② <u>Multiplying</u> - utilize distributing and FOIL.

③ <u>Factoring</u> - Types

a.) <u>Common factors</u> - do all terms have common factors/variables?

$ax^2+bx+c \rightarrow$ b.) <u>Trinomial</u> - do factors of $a \cdot c$ = sum of b (has 3 terms)
$*\, a=1$ $\quad *\, a \neq 1 \rightarrow$ group

c.) <u>Difference of Squares</u> $a^2-b^2=(a+b)(a-b)$ (has 2 terms)

d.) <u>Difference of Cubes</u> $a^3 \pm b^3 = (a \pm b)(a^2 \mp 2ab + b^2)$ (has 2 terms)

$ax^2+bx+c \rightarrow$ e.) <u>Grouping</u>: $(ax^2-bx)+(ax-b) = x(ax-b)+1(ax-b)$ (has 4 terms)
$= (x+1)(ax-b)$

$\star$ used extensively when $a \neq 1$

④ <u>Evaluating</u> - when in form $f(x) =$ ______. Plug in x values.

⑤ <u>Division</u> - try to factor + cancel 1st. If that doesn't work:

a.) <u>Long Division</u> - works when dividing with a divisor who's degree >1. Ex: $\dfrac{3x^4 - x^5 + 4x^2 - 7 + 2x}{x^2 - 5x + 2}$

b.) <u>Synthetic Division</u> - works when (1) given zeros ($(x-a) \Rightarrow x=a \Rightarrow f(a)=0$)
(2) divisor has degree $=1$.

a| _ _ _ _ $\qquad$ Ex: $(2x^3 - x^2 + 3) \div (x-3)$

$\downarrow$ $\nearrow$

_ $\qquad$ $\boxed{R}$

$\star$ Put in decreasing order of power

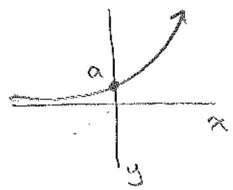
$\star$ If $R = 0$, then the a is a factor

Exponentials & Logarithms

① <u>Exponentials</u> – $y = ab^x$

i) Growth: $b > 1$

a is yint



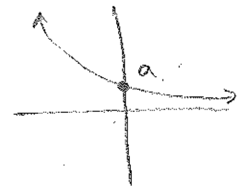
Domain: ALL Reals

Range: $y > 0$

H.A: $y = 0$

ii) Decay: $0 < b < 1$

a is yint



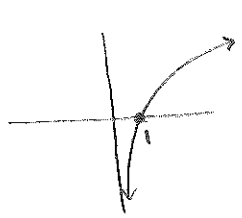
Domain: ALL Reals

Range: $y > 0$

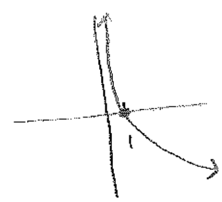
H.A: $y = 0$

② <u>Logarithms</u> – $y = \ln x$ or $y = \log_a x$

i) $b > 1$



ii) $0 < b < 1$ (fraction)



Domain: $x > 0$ Range: $\mathbb{R}$ V.A: $x = 0$

* $\log x$ (common base 10) AND $\ln x$ (natural base e)

③ <u>Logarithms</u> & <u>Exponentials</u> are inverses of one another. To undo one, use the other.

Ex:) $\log_3(4x-7) = 2$ $e^x = 8$

④ <u>Properties of Logarithms</u>:

- $\log_a 1 = 0$
- $\log_a a = 1$
- $a^{\log_a M} = M$
- $r \log_a x = \log_a x^r$
- $\log_a(MN) = \log_a M + \log_a N$
- $\log_a\left(\frac{M}{N}\right) = \log_a M - \log_a N$

Ex: Expand: $\log_a(x\sqrt{x^2+1})$ Condense: $\log_a 7 + 4\log_a 3$

⑤ <u>Solving</u>: isolate log/exp on one side. Undo w/ inverse exp/log & solve.

Algebra II EOC Review

Day 8

Polynomials: Zeroes * Heavy use of graphing calculator

(1) Largest power (degree) tells the number of zeros for function

(2) Types of zeros - type equation into $\boxed{y=}$

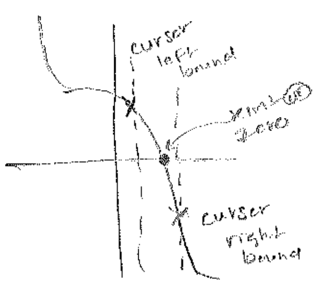
a.) Real - on a graph crosses the x-axis

i) Rational - decimal terminates/repeats (integers, fractions)

ii) Irrational - decimal never ends (π, e, $\sqrt{\ }$)

* $\boxed{\text{Calculator}}$

To determine if a zero is rational/irrational:



(1) Type equation into $\boxed{y=}$

(2) $\boxed{2^{nd}}$ + $\boxed{\text{TRACE}}$ + $\boxed{2}$ (zero)

(3) Left Bound: Move cursor to left side of zero (x int) & press $\boxed{\text{Enter}}$

(4) Right Bound: Move Cursor to right side of zero. & press $\boxed{\text{Enter}}$

(5) Guess: Press $\boxed{\text{Enter}}$

(6) Does x terminate/repeat OR go on forever?

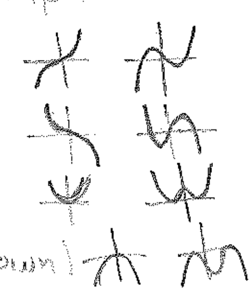
b.) Imaginary (i) - doesn't cross the x-axis AND always comes
Complex in pairs [Ex: x^3 → has either 3 real, 0 imaginary OR 1 real, 2 imaginary

it couldn't have 2 real, 1 imag
not paired

(3) End Behavior - how do the ends of the graph behave

a.) Odd Degree (Power) → x^{odd} (down/up)
→ x^{-odd} (up/down)

b.) Even Degree (Power → x^{even} (up/up)
→ x^{-even} (down/down)



(4) (i) Possible Rational Roots (possible roots)

a.) arrange in descending power $ax^n + bx^{n-1} + \dots + c$

b.) $p \to$ constant term $q \to$ lead coefficient (# in front of highest power)

c.) $\frac{\text{Factors of } p}{\text{Factors of } q}$

d.) Use synthetic division if asked to find the roots

(ii) Descartes Rule (only identifies possible # of real roots)

a.) arrange in descending order for $f(x)$

b.) Count sign changes = max # of positive zeros (x-int) (real)

c.) Find $f(-x) \to$ plug in $-x \to$ if $(-x)^{odd} \to -x^{odd}$

$\hookrightarrow$ if $(-x)^{even} \to x^{even}$

d.) Count sign changes = max # of negative zero (x-int) (real)

e.) Positives occur in mult 2's
Negatives?

Ex) 3 or 1 ; 4, 2, or 0 ; etc.

Algebra II EOC Review

Day 9

$\boxed{\text{Rationals}}$ aka fractions

① Word Problems: often times will involve rates $\boxed{rate = \frac{amt}{time}}$ so $\boxed{amt = rate \times time}$
(Rate)

i) Set rate equations up: $\frac{amt}{T_1} + \frac{amt}{T_2} = \frac{\text{Total amt}}{T_{total}}$ ← Rate

ii) Set amt equations up: $rate1 \cdot T + rate2 \cdot T = \text{Total Amt}$

② Simplify – Factor then cancel

③ Multiplying – multiply top / multiply Bottom ★ Factor & Cancel

④ Dividing – Keep Top + flip Bottom then multiply ★ factor cancel

⑤ Add / Sub – get a LCD (make sure same). ① Multiply Top & Bottom of individual fractions by LCD, ② add/sub top, ③ keep Bottom same.

⑥ Solving – ① Get one fraction on each side, ② cancel anything that appears in same place on both sides, ③ CROSS MULTIPLY.

$\boxed{\text{Roots}}$ aka radicals $\sqrt{\ }$

① Anatomy: $\sqrt[n]{a}$; n = index a = radicand

② Simplifying: ① Create a factor tree for #'s and variables $\overset{4}{\hat{2}\,2}$ $\overset{x^5}{xxxxx}$

② Look at index, you need this many of a # or variable to factor it out. If there's not enough it stays in root.

③ Multiply: ① can only multiply if same index, ② Multiply insides, ③ Simplify. $\sqrt[n]{a} \cdot \sqrt[n]{b} = \sqrt[n]{ab}$

④ Dividing: i) Normal: $\frac{\#}{\sqrt{\ }}$ multiply top/bottom by root $\frac{\#}{\sqrt{\ }} \cdot \left(\frac{\sqrt{\ }}{\sqrt{\ }}\right)$

★ simplify

ii) Rationalize: $\frac{\#}{a+\sqrt{\ }}$ multiply top/bottom by conjugate $\frac{\#}{(a+\sqrt{\ })} \cdot \frac{(a-\sqrt{\ })}{(a-\sqrt{\ })}$

⑤ Solving: ① Isolate root, ② Undo root by raising both sides to power (inverse), ③ Solve.

★Test Hint: plug in answer choices.

⑥ Add/Sub: ① Simplify ② can only add/sub #'s outside root if same ① index AND ② radicand

$\sqrt{2} + 2\sqrt{2} = 3\sqrt{2}$

Exponents

① Adding/Subtracting: can only add/sub coefficients if they are like terms (same power) $x^2 + 3x^2 = 4x^2$

② Multiplying: when multiplying exponents (same base), you add the powers $a^5 \cdot a^2 = a^{5+2} = a^7$

③ Dividing: two ways to think about this ① subtract powers or ② cancel $\frac{a^5}{a^2} = a^{5-2} = a^3$ or $\frac{a^{\cancel{5}\,3}}{\cancel{a^2}} = a^3$

④ Exponential: a power to a power, multiply the powers

$(a^5)^2 = a^{10}$

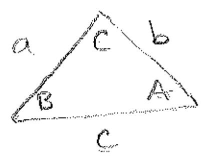
⑤ Rational: $a^{5/2}$ ← top = power, ← bottom = root $= \sqrt[2]{a^5}$

Algebra II EOC Review

Day 4

$\boxed{\text{OBLIQUE TRIG}}$ ★ No Right angles

① Law of Sines - used when you know at least one side and angle opposite.

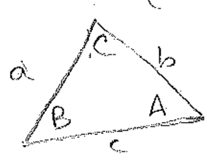


$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

★ when solving for an angle, need to use inverse trig function

★ If given two angles, find 3rd 1st.

② Law of cosines used when you know two adjacent sides (SAS + SSS)



known

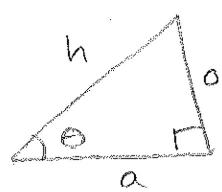
$$a^2 = b^2 + c^2 - 2bc\cos A$$

one of these is to be solved for

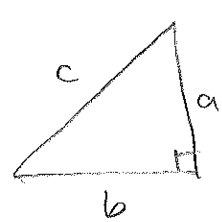
★ refer to ★ in #1

$\boxed{\text{Right Triangle}}$ ★ triangle has a right angle

① Trig Functions $\sin\theta = \frac{o}{h}$, $\cos\theta = \frac{a}{h}$, $\tan\theta = \frac{o}{a}$



② Pythagorean Thm $a^2 + b^2 = c^2$



Radian / Degree

① $180° = \pi$ rad $= \frac{1}{2}$ revolution

② Use field goals & cancel top unit w/ bottom

1.) Deg → rad $\quad \dfrac{\#° \mid \pi \text{ rad}}{\mid 180°}$ $\quad$ ∴ ° cancels

2.) rad → deg $\quad \dfrac{\#\text{rad} \mid 180°}{\mid \pi \text{ rad}}$ $\quad$ ∴ rad cancels

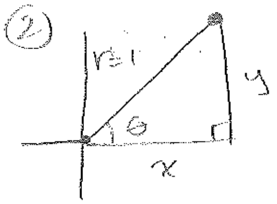
3.) rad → rev $\quad \dfrac{\#\text{rad} \mid \frac{1}{2} \text{ rev}}{\mid \pi \text{ rad}}$ $\quad$ rad cancels

Unit Circle

★ refer to wrkst w/ unit circle

① $\frac{n\pi}{2} = n \cdot 90°$, $\frac{n\pi}{3} = n \cdot 60°$, $\frac{n\pi}{6} = n \cdot 30°$, $\frac{n\pi}{4} = 45°$

②

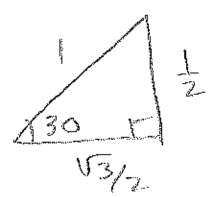


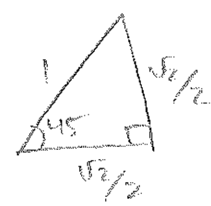
$\cos\theta = \frac{a}{h} = \frac{x}{1} = x$

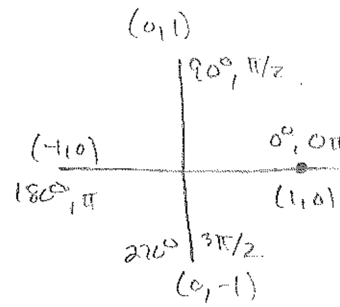
$\sin\theta = \frac{o}{h} = \frac{y}{1} = y$

$\tan\theta = \frac{o}{a} = \frac{y}{x}$

③ Special Triangles:



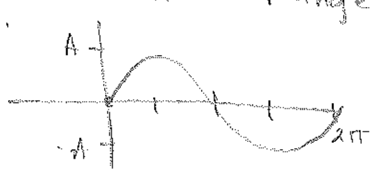




Graphs

① $y = A \sin x$

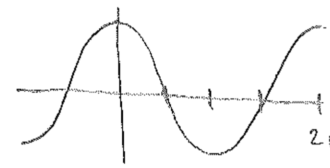
- starts at 0 b/c $\sin 0° = 0$, $y = 0$
- Domain: $\mathbb{R}$ $\quad$ Range: $-A \le y \le A$



Period: 2π

② $y = A \cos x$

- starts at A (or 1)
- Domain: $\mathbb{R}$ $\quad$ Range: $-A \le y \le A$



Period 2π

③ $y = A \sin \omega x$ or $y = A \cos \omega x$

- period $= \frac{2\pi}{\omega}$ $\quad$ frequency $= \omega$
- amplitude $= |A|$

Algebra II EOC Review

Day 12

Sequences

① Sequences: patterns $(a_1, a_2, a_3, \ldots, a_n)$

a.) arithmetic - patterns when add/subtracting a common # called common difference, d

$$\boxed{a_n = a_1 + (n-1)d}$$

a_n = n^{th} term

a_1 = 1^{st} term

n = # of terms

d = common difference

★ Note: you can change a_n and a_1 to any term as long as you change all n's & 1's. Ex.) a_8 & a_2

$$a_8 = a_2 + (8-2)d$$

b.) geometric - patterns when multiply/dividing a common # called common ratio.

$$\boxed{a_n = a_1 r^{n-1}}$$

★ Note: see note above

a_n = n^{th} term

a_1 = 1^{st} term

n = # terms

r = common ratio

② Series: sums of patterns $(a_1 + a_2 + a_3 + \ldots + a_n)$

a.) arithmetic

$$S_n = \frac{n}{2}(a_1 + a_n)$$

★ see note above

S_n = sum

n = # terms

a_1 = 1^{st} term

a_n = n^{th} term

Series continued

b.) geometric

$$S_n = \frac{a_1 - a_1 r^n}{r-1}$$

S_n = sum

a_1 = 1^{st} term

r = common ratio

n = # terms

c.) Sigma Notation

$$\sum_{n=1}^{n} a_n = a_1 + a_2 + a_3 + \cdots + a_n$$

a_n = geometric sequence $a_n = a_1 r^{n-1}$
or arithmetic sequence $a_n = a_1 + (n-1)d$

n = last # term

Example

$$\sum_{n=1}^{6} (3-4n) = (3-4\cdot1) + (3-4\cdot2) + \cdots + (3-4\cdot6)$$

6th term

1st term

arithmetic sequence

* plug in term #

Calculator $\boxed{2^{nd}}$ + $\boxed{\text{WINDOW}}$ + $\boxed{2}$

Algebra II EOC Review

Day 13

$\boxed{\text{Matrices}}$

① Dimensions: Row x Column

$$[A] = \begin{array}{r} \text{row 1} \rightarrow \\ \text{row 2} \rightarrow \\ \\ \end{array} \begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix}$$

$$\begin{array}{ccc} \uparrow & \uparrow & \uparrow \\ \text{column 1} & \text{column 2} & \text{column 3} \end{array}$$

② Element: #'s inside matrix $A_{\text{row/column}}$. Ex) $A_{13} = c$ (# row 1 column 3)

③ Addition/Subtraction: add/subtract corresponding elements ex:) $a_{11} + b_{11}$

* have to be same dimensions

$$\begin{bmatrix} a & b & c \\ d & e & f \end{bmatrix} \pm \begin{bmatrix} A & B & C \\ D & E & F \end{bmatrix} = \begin{bmatrix} a \pm A & b \pm B & c \pm C \\ d \pm D & e \pm E & f \pm F \end{bmatrix}$$

④ Multiplication: a.) Can only work if $\overline{A \quad \times \quad D}$ $a \times \underbrace{c \quad c}_{\text{same}} \times d$ matches

b.) Size of new matrix $a \times d$

c.) $A = \begin{bmatrix} a & b \\ c & d \\ e & f \end{bmatrix}$ $B = \begin{bmatrix} A & B & C \\ D & E & F \end{bmatrix} \Rightarrow AB =$

$$\begin{array}{cc} & B\begin{bmatrix} A & B & C \\ D & E & F \end{bmatrix} \\ A\begin{bmatrix} a & b \\ c & d \\ e & f \end{bmatrix} & \begin{bmatrix} Aa\text{-}bD & aB\text{-}bE & aC\text{-}bF \\ cA\text{-}dD & cB\text{-}dE & cC\text{-}dF \\ eA\text{-}fD & eB\text{-}fE & eC\text{-}fF \end{bmatrix} \end{array}$$

$\underbrace{3 \times \underbrace{2 \quad 2}_{\text{same}} \times 3}$ $\xrightarrow[\text{dimensions}]{\text{New}}$ 3×3

Match so its possible

⑤ Determinant: a.) 2 X 2

Brackets represent matrix vs Bars represent determinant

$$A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \quad \text{so} \quad \det A = \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

b.) 3 X 3

mark out row 1 column 1 — mark out row 1 column 2 — mark out row 1 column 3

$$A = \begin{bmatrix} x & y & z \\ a & b & c \\ d & e & f \end{bmatrix} = \begin{vmatrix} b & c \\ e & f \end{vmatrix} x - \begin{vmatrix} a & c \\ d & f \end{vmatrix} y + \begin{vmatrix} a & b \\ d & e \end{vmatrix} z$$

always minus

$$= \det \cdot x - \det \cdot y + \det \cdot z$$

⑥ Inverse: $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ so $A^{-1} = \dfrac{1}{\det A} \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$ Note: flip a + d, opp sign on b + c

* do 3X3 on calc

7) Solving Equations: If A, B, C are matrices:

$$AX + B = C$$

a.) Solve like any equation except instead of division, mult by inverse

$$\frac{AX}{A} = \frac{C-B}{A}$$

$$X = A^{-1}(C-B)$$

inverse multiplication add/sub of matrix

b.) Need to know inverse

(see previous notes #1-6)

8) Calculator:

a.) Create a Matrix: $\boxed{2^{nd}}$ + $\boxed{X^{-1}}$ (matrix) + $\boxed{\rightarrow}$ x2 (Edit)

b.) Add/Sub/Mult Matrices: Create Matrices as two different matrices (A & B for instance).

Then: $\boxed{2^{nd}}$ + $\boxed{X^{-1}}$ (matrix) + select matrix + $\boxed{+}$ OR $\boxed{-}$ OR $\boxed{\times}$ choose operation

+ $\boxed{2^{nd}}$ + $\boxed{X^{-1}}$ (matrix) + select other matrix + $\boxed{\text{Enter}}$

c.) Inverse Matrix: Create Matrix

Then: $\boxed{2^{nd}}$ + $\boxed{X^{-1}}$ (matrix + select matrix + $\boxed{X^{-1}}$ inverse + $\boxed{\text{Enter}}$

d.) Determinant: Create Matrix

Then: $\boxed{2^{nd}}$ + $\boxed{X^{-1}}$ (matrix) + $\boxed{\rightarrow}$ x1 (math) + $\boxed{1}$ (det)

+ $\boxed{2^{nd}}$ + $\boxed{X^{-1}}$ (matrix) + $\boxed{\text{Enter}}$