

Name: Key No. _____ Per: 7 Date: _____
 Serafino · Precalculus S1 M T W R F

3A

Periodic Functions & Sinusoids

Classwork / Homework: graph & analyze Sine, Cosine, Secant and Cosecant functions (ABD)

The Sine Parent Function

$f(x) = \sin(x)$

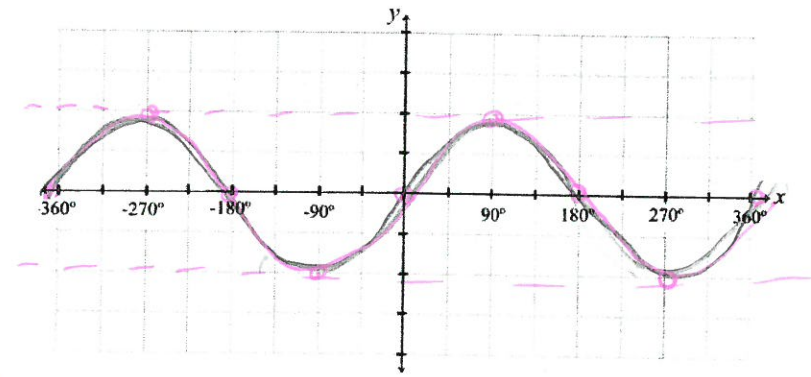
Domain: $x \in \mathbb{R}$

Range: $y \in [-1, 1]$

Natural Period: 360°

x-intercepts: $x \in \{180^\circ k, k \in \mathbb{Z}\}$

"k is an element of the integers"



The Cosine Parent Function

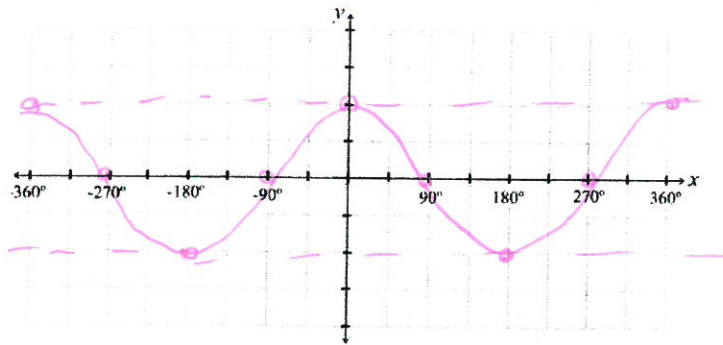
$f(x) = \cos(x)$

Domain: $x \in \mathbb{R}$

Range: $y \in [-1, 1]$

Natural Period: 360°

x-intercepts: $x \in \{90^\circ + 180^\circ k\}$



	Sinusoidal Axis	Range	Domain	Frequency	Period	Increment	"Starting Point"
Analyzing Sine & Cosine:	SA: "Midline" b/w max and min	R: The interval of function values from min to max	D: What angles can you take the trig ratio of?	F: How many full cycles completed in the Natural Period	P: The actual length of one full cycle	I: The important SA, max/min points, every 1/4 th of a period	SP: Where is your function
$y = \sin(x)$	$y=0$	$[-1, 1]$	\mathbb{R}	1	360°	90°	$x=0$ on SA
$y = \cos(x)$	$y=0$	$[-1, 1]$	\mathbb{R}	1	360°	90°	$x=0$ above SA

Analyzing Graphs from the Equations:	SA	R	F	P	I	SP
$y = 2 \sin(x)$	$y=0$	$[-2,2]$	1	360°	90°	on SA $x=0$
$y = 4 \sin(x) + 10$	$y=10$	$[6,14]$	1	360°	90°	on SA $x=0$
$y = \cos(2x) - 3$	$y=-3$	$[-4,-2]$	2	180°	45°	above SA $x=0$
$y = -5 \cos(3x) - 5$	$y=-5$	$[-10,0]$	3	120°	30°	below SA $x=0$
$y = -8 \sin(10x)$	$y=0$	$[-8,8]$	10	36°	9°	on SA $x=0$
$y = -4 \cos(5x) + 20$	$y=20$	$[16,24]$	5	72°	18°	below SA $x=0$
$y = \sin\left(\frac{2}{3}x\right) - 54$	$y=-54$	$[-55,-53]$	$\frac{2}{3}$	540°	135°	on SA $x=0$
$y = 10 \cos\left(\frac{x}{2}\right) + 5$	$y=5$	$[-5,15]$	$\frac{1}{2}$	720°	180°	above SA $x=0$
What math did you do?	$y=d$	$[d+a]$	B	$\frac{NP}{B}$	$\frac{P}{4}$	set () = 0

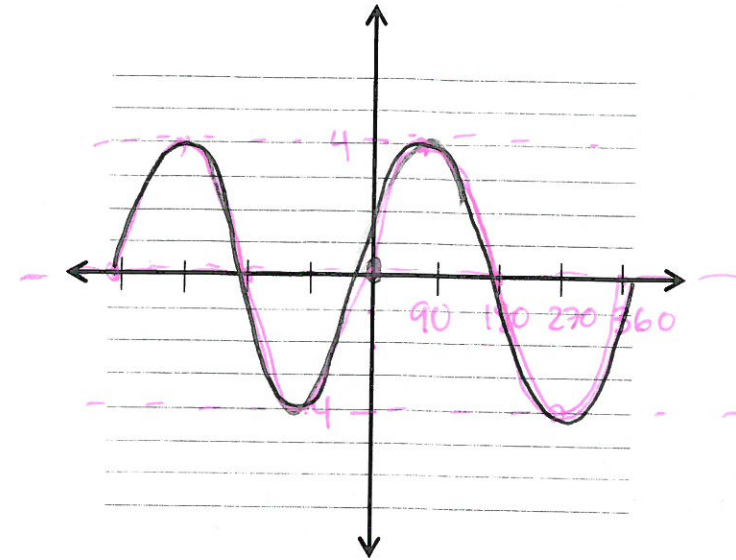
Analyzing Sinusoids:

	SA: $y=0$ a: 3 P: 720 F: $\frac{1}{2}$		SA: $y=0$ a: 4 P: 120 F: 3
$y = 3 \cos\left(\frac{1}{2}x\right)$		$y = 4 \cos(3x)$	
	SA: $y=0$ a: 2 P: 1080 F: $\frac{1}{3}$		SA: $y=2$ a: 4 P: 270 F: $\frac{3}{4}$
$y = 2 \sin\left(\frac{1}{3}x\right)$		$y = -4 \sin\left(\frac{3}{4}x\right) + 2$	
	SA: $y=0$ A: 1 P: 120° F: 3	$y = \sin(3x)$	

Sketch the trig functions.

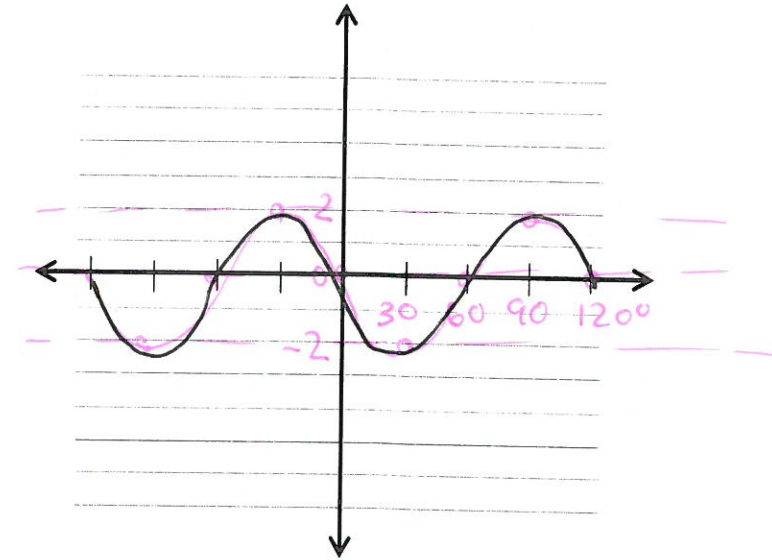
1. $y = 4 \sin(x)$

A	4	SA	$y=0$
D	$x \in \mathbb{R}$		
R	$y \in [-4, 4]$		
P	360°		
I	90°		



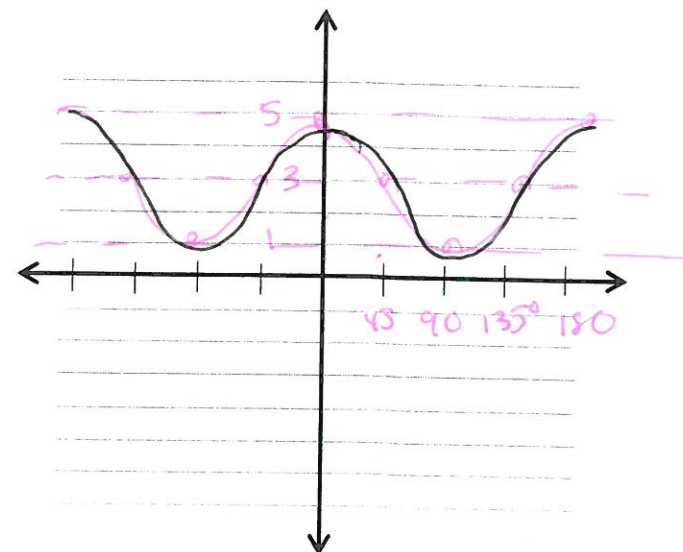
2. $y = -2 \sin(3x)$

A	2	SA	$y=0$
D	$x \in \mathbb{R}$		
R	$y \in [-2, 2]$		
P	$\frac{360}{3} = 120^\circ$		
I	$\frac{120}{4} = 30^\circ$		



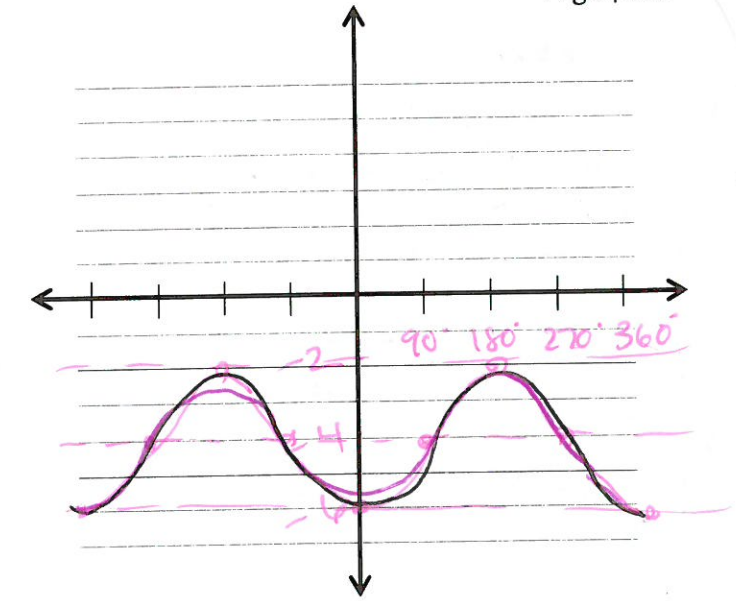
3. $y = 2 \cos(2x) + 3$

A	2	SA	$y=3$
D	$x \in \mathbb{R}$		
R	$y \in [1, 5]$		
P	$\frac{360}{2} = 180$		
I	$\frac{180}{4} = 45^\circ$		



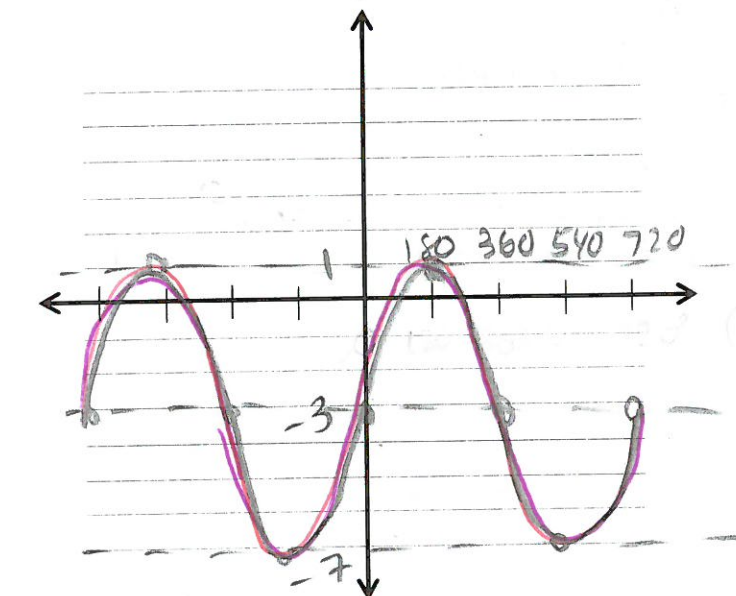
4. $y = -2\cos(x) - 4$

A	2	SA	$y = -4$
D	$x \in \mathbb{R}$		
R	$y \in [-6, -2]$		
P	360°		
I	90°		



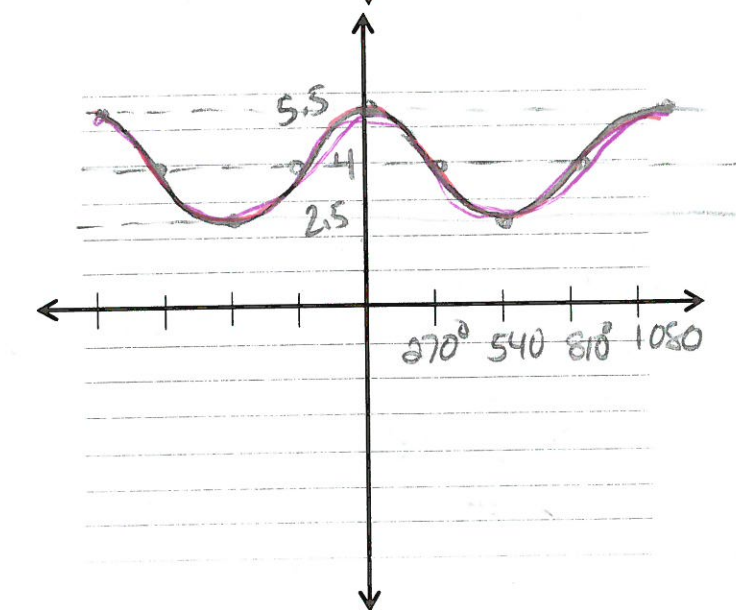
5. $y = 4\sin(1/2 x) - 3$

A	4	SA	$y = -3$
D	$x \in \mathbb{R}$		
R	$y \in [-7, 1]$		
P	$\frac{360}{1/2} = 720^\circ$		
I	$\frac{720}{4} = 180^\circ$		



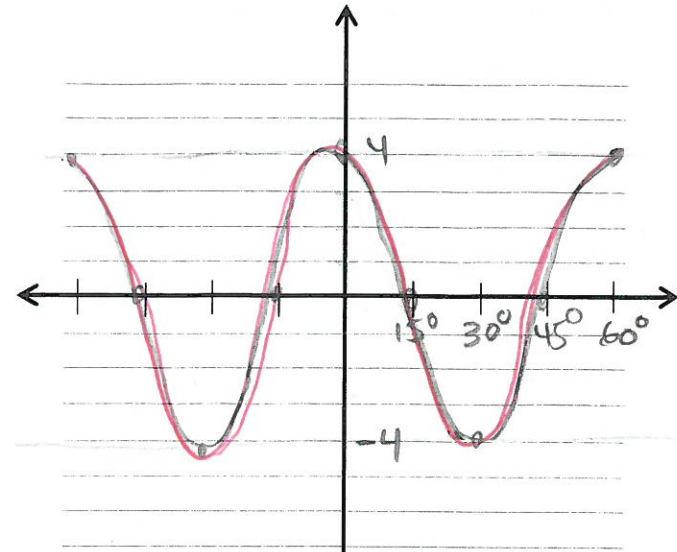
6. $y = 1.5\cos(\frac{x}{3}) + 4$

A	1.5	SA	$y = 4$
F	$\frac{1}{3}$		
P	$\frac{360}{1/3} = 360 \cdot 3 = 1080^\circ$		
I	$\frac{1080}{4} = 270^\circ$		
D	$x \in \mathbb{R}$		
R	$y \in [2.5, 5.5]$		



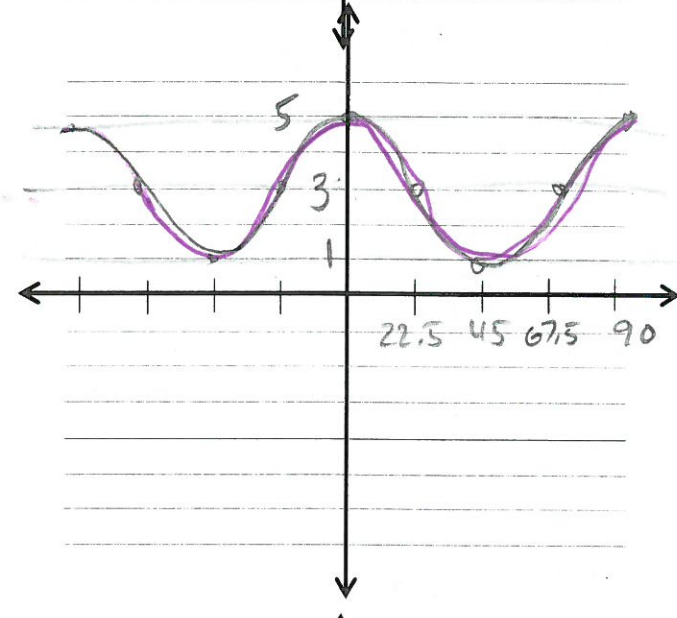
7. $y = 4 \cos(6x)$

A	4	SA	$y = 0$
F	6		
P	$\frac{360}{6} = 60^\circ$		
I	$\frac{60}{4} = 15^\circ$		
D	$x \in \mathbb{R}$		
R	$y \in [-4, 4]$		



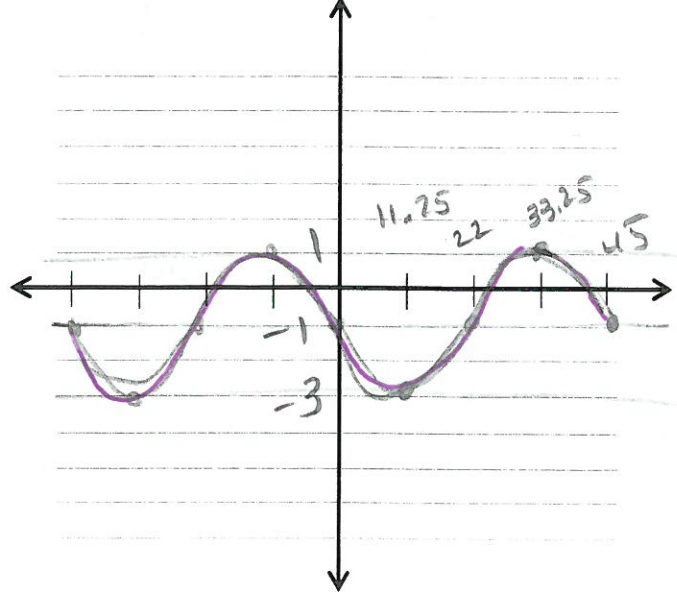
8. $y = 3 + 2\cos(4x)$

A	2	SA	$y = 3$
F	4		
P	$\frac{360}{4} = 90^\circ$		
I	$\frac{90}{4} = 22.5$		
D	$x \in \mathbb{R}$		
R	$y \in [1, 5]$		



9. $y = -2 \sin(8x) - 1$

A	2	SA	$y = -1$
F	8		
P	45		
I	$\frac{45}{4} = 11.25$		
D	$x \in \mathbb{R}$		
R	$y \in [-3, 1]$		



The Cosecant Parent Function

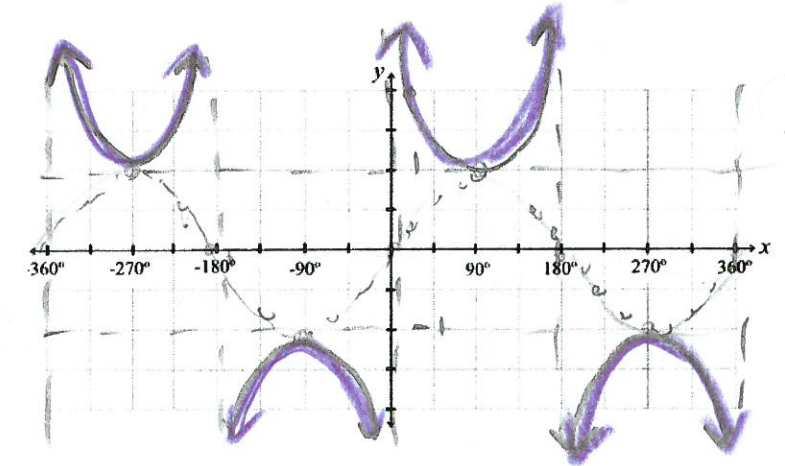
$$f(x) = \csc(x)$$

Domain: $x \neq 180^\circ k$

Range: $y \leq -1$ or $y \geq 1$

Natural Period: 360°

x-intercepts: none



The Secant Parent Function

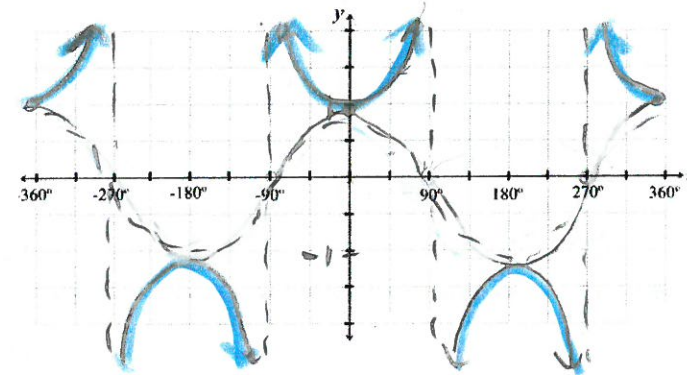
$$f(x) = \sec(x)$$

Domain: $x \neq 90^\circ \pm 180^\circ k$

Range: $y \leq -1$ or $y \geq 1$

Natural Period: 360°

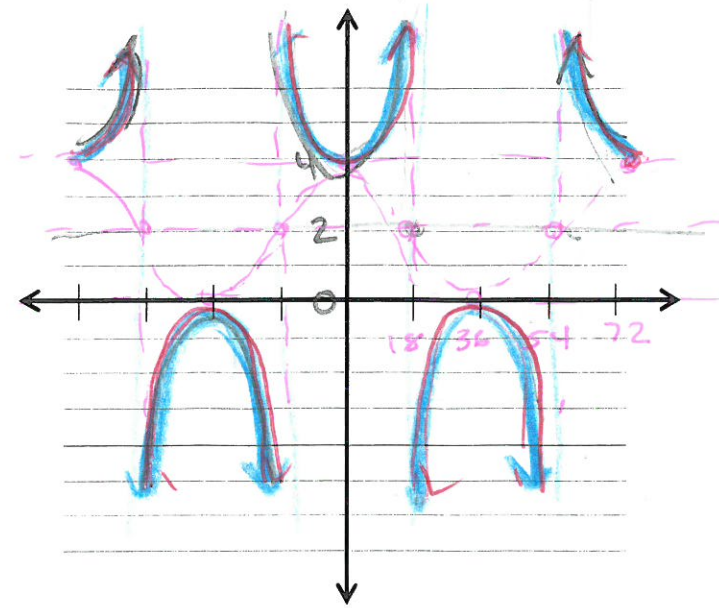
x-intercepts: none!



	SA	Range	Domain	Frequenc y	Period	Increment	"Starting Point"
Secant & Cosecant	SA: "Midline" b/w max and min	R: The interval of function values from min to max	D: What angles can you take the trig ratio of?	F: How many full cycles completed in the Natural Period	P: The actual length of one full cycle	I: The important SA, max/min points, every 1/4 th of a period	SP: Where is your function
$y = \csc(x)$	$y = 0$	$y \leq -1$ or $y \geq 1$	$x \neq 180^\circ k$ (where $\sin = 0$)	1	360°	90°	$x = 0$ asymptote
$y = \sec(x)$	$y = 0$	$y \leq -1$ or $y \geq 1$	$x \neq 90^\circ \pm 180^\circ k$ (where $\cos = 0$)	1	360°	90°	$x = 0$ above

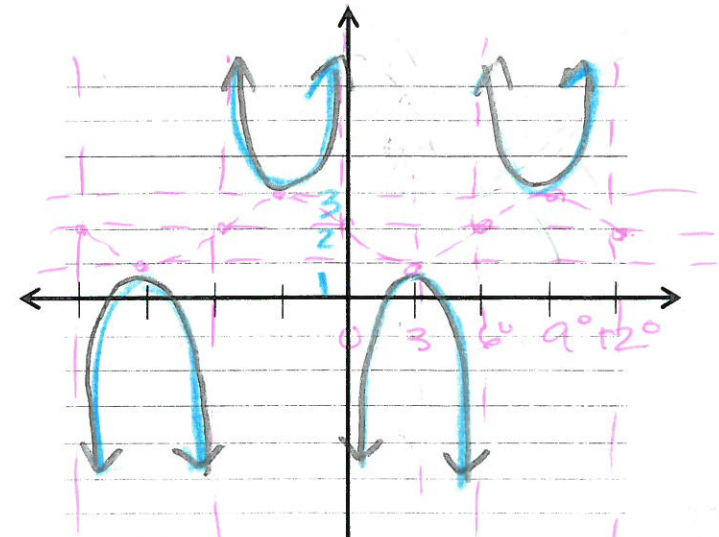
10. $y = 2\sec(5x) + 2$

A	"none" $a=1$	SA	$y=2$
F	5		
P	$\frac{360}{5} = 72$		
I	18°		
D	$x \neq 18^\circ \pm 36^\circ k$		
R	$y \leq 0$ or $y \geq 4$		



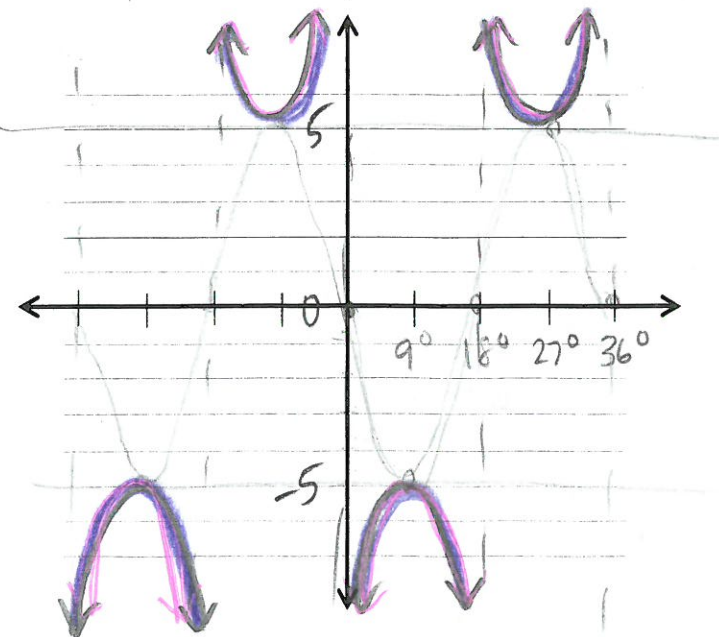
11. $y = -\csc(30x) + 2$

A	"none" $a=1$	SA	$y=2$
F	30		
P	12° $\frac{360}{30}$		
I	3° $\frac{12}{4}$		
D	$x \neq 6^\circ k$		
R	$y \leq 1$ or $y \geq 3$		



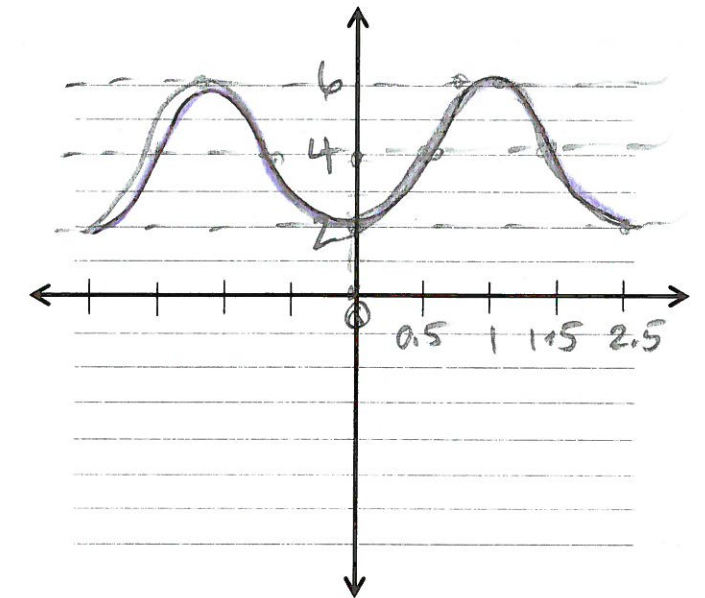
12. $y = -5\csc(10x)$

A	5	SA	$y=0$
F	10		
P	$\frac{360}{10} = 36^\circ$		
I	$\frac{36}{4} = 9^\circ$		
D	$x \neq 18^\circ k$		
R	$y \leq -5$ or $y \geq 5$		



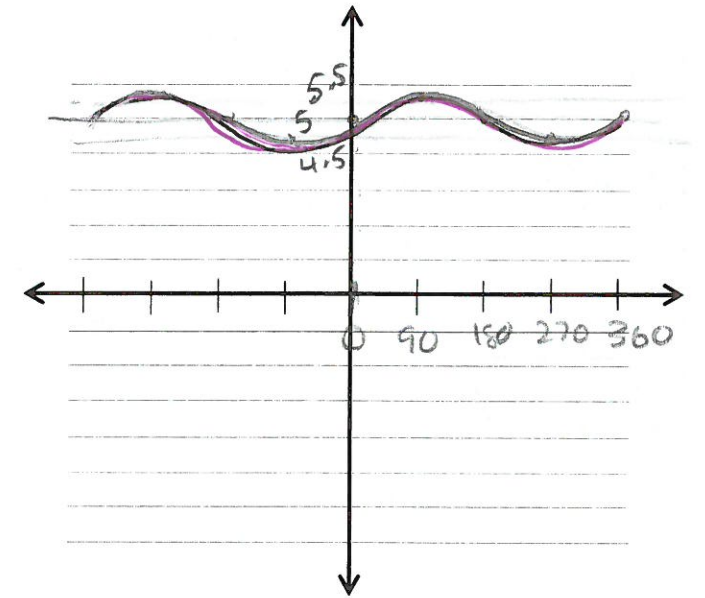
13. $y = 4 - 2 \cos(180x)$

A	2	SA	$y = 4$
F	180°		
P	$\frac{360}{180} = 2$		
I	$\frac{2}{4} = 0.5$		
D	$x \in \mathbb{R}$		
R	y		



14. $y = \frac{1}{2} \sin(x) + 5$

A	$\frac{1}{2}$	SA	$y = 5$
D	$x \in \mathbb{R}$		
R	$y \in [4.5, 5.5]$		
P	360		
I	90°		



$\frac{3}{2} = 1.5$

15. $y = \frac{3}{2} \cos(x) - 2$

A	$\frac{3}{2}$	SA	$y = -2$
D	$x \in \mathbb{R}$		
R	$y \in [-3.5, -0.5]$		
P	360		
I	90°		

