Tiny :3
(Note: for the Amplitude is the absolute value of the coefficient)
(note: x + c can be rewritten as x-(-c) with -c being the phase shift)
(Note: if the Amplitude is negative flip it upside down)
(note: if the graph goes downward at the start its negative, if it goes up its positive)
If I have to find y(1.3) or something then plug 1.3 into x in the equation to get the answer
Sect size = tick and phase shift = start

Transforming points

how to get all 5 transformation points
For first point use C as X and the and put the Y as the starting point
then add 1/4 of the period to C every time I go to the next point and go one amplitude up or down

$$\frac{a}{\frac{b}{c}} = a \times \frac{c}{b}$$

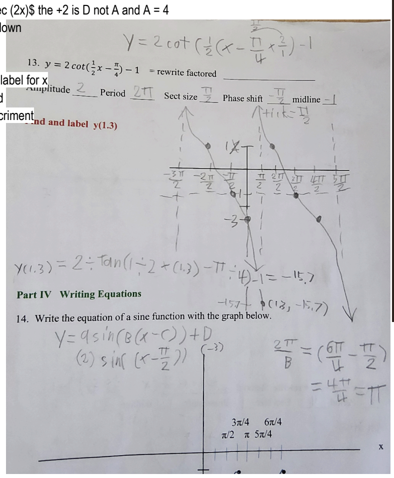
$$y = Af[B(x - C)] + D$$

graph to equation
Find
A: find out how many units the graph goes up from the bottom and divide it in half
B: How long does one cycle of the graph go for then set that equal to $\frac{2\pi}{B}$
C: phase shift = horizontal distance from origin to middle
D: how many units does the midline of the graph move up or down
To find the frequency from a period you just $\text{frequency}=\frac{1}{\text{period}}$

to graph sec and csc functions you can
if graphing csc first graph sin
if graphing sec first graph cos
if A is negative just flip it upside down
draw U shaped lines that have their center at the max and min points and the lines go extend outward until the nearest inflection points
and when writing ranges you do $(-\infty,x] \cup [x,\infty)$
with x being the usual ranges
Note: a problem like $y=2+4\sec (2x)$ the +2 is D not A and A = 4
If A is negative draw it upside down

LABEL GRAPH

Use the phase shift as the first label for x
Then divide the period by 4 and
add 1/4 of the period every incriment
To convert the period (p)
you can do B = 2pi/p



	0	30	45	60	90
		$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
SIN	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{4}}{2}=1$
COS	$\frac{\sqrt{4}}{2}=1$	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
Tan	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undifined

Degrees	Radians	Coordinates (x, y)
30°	$\frac{\pi}{6}$	$\left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
45°	$\frac{\pi}{4}$	$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
60°	$\frac{\pi}{3}$	$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
90°	$\frac{\pi}{2}$	$(0, 1)$
120°	$\frac{2\pi}{3}$	$\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$
135°	$\frac{3\pi}{4}$	$\left(-\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$
150°	$\frac{5\pi}{6}$	$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$
180°	π	$(-1, 0)$
210°	$\frac{7\pi}{6}$	$\left(-\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
225°	$\frac{5\pi}{4}$	$\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
240°	$\frac{4\pi}{3}$	$\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
270°	$\frac{3\pi}{2}$	$(0, -1)$
300°	$\frac{5\pi}{3}$	$\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$
315°	$\frac{7\pi}{4}$	$\left(\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$
330°	$\frac{11\pi}{6}$	$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$
360°	2π	$(1, 0)$

- $A = 2$ (if nothing is there it is 1)
- $B = 2\pi$ (if nothing is there it is 1)
- $C = \frac{1}{2}$ (if nothing is there it is 0)
- $D = -1$ (if nothing is there it is 0)

To get the **Amplitude** you take the number before the trig function (coefficient) with it being the 2 in $y = 2\cos$
To get the **period** you put $\frac{2\pi}{B}$ and in this case be being 2π resulting in 1 as the period
To get the **Sect Size (tick)** you divide the **period** by 4 so its $\frac{1}{4}$
to get the **Phase shift (start)** you can take C which in this case is $\frac{1}{2}$
to get the **midline** you take D which in this case is -1
to get the **range** is = $[D - A, D + A]$ so $[-1-2, -1+2] = [-3, 1]$
to get the **frequency** is $\frac{B}{2\pi}$ so the reciprocal of the period which in this case is still 1 since its $\frac{2\pi}{2\pi}$

Property	Symbol	Value	Explanation
Amplitude	A	2	Height from midline to peak
Period	$\frac{2\pi}{B}$	1	Length of one full cycle
Section Size		¼	Period ÷ 4
Phase Shift	C	0.5	Shift right by 0.5
Midline	y=D	y = -1	Vertical shift
Range		[-3, 1]	From minimum to maximum y-value
Frequency	$\frac{B}{2\pi}$	1	

finding asymptotes

how to find vertical asymptotes for sec and csc functions

1. rewrite the function using reciprocal identity
   - $\sec x = \frac{1}{\cos x}$
   - $\csc x = \frac{1}{\sin x}$
2. set the denominator = 0 (where the function is undefined)
   - for sec: $\cos x = 0$
   - for csc: $\sin x = 0$
3. solve for x
   - $\cos x = 0 \rightarrow x = \frac{\pi}{2} + n\pi$
   - $\sin x = 0 \rightarrow x = n\pi$

   (where n is any integer)
4. if there's a **B** or **C** inside (like $y = \sec(Bx - C)$ or $y = \csc(Bx - C)$)
   solve
   - $\cos(Bx - C) = 0$ or $\sin(Bx - C) = 0$

   $\rightarrow Bx - C = \frac{\pi}{2} + n\pi$ or $Bx - C = n\pi$
   then
   $\rightarrow x = \frac{C + \frac{\pi}{2} + n\pi}{B}$ or $x = \frac{C + n\pi}{B}$
5. draw **dotted vertical lines** at those x-values — that's where asymptotes go

tips for sec and csc graphs

- for sec, first graph **cosine**, then draw **U and n shapes** centered on the max and min points of cosine
- for csc, first graph **sine**, then draw **U and n shapes** centered on the max and min points of sine
- the graph never crosses the asymptotes
- each "U" or "n" section repeats every **period**

example

for $y = 12\sec x$
→ $\cos x = 0$ at $x = \frac{\pi}{2} + n\pi$
✅ vertical asymptotes at $x = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{5\pi}{2}, \ldots$

:3
You can do this !!!!

How to get frequency (cycles/sec) from $y = \sin(Bx + \dots)$ or $y = \cos(Bx + \dots)$

Key idea:

If the function is written as $y = \sin(Bx + \cdots)$ or $y = \cos(Bx + \cdots)$, the coefficient B is the **angular frequency** ω (radians per second). The ordinary frequency (cycles per second, Hz) is

$$f = \frac{\omega}{2\pi} = \frac{B}{2\pi}.$$

Phase shifts, vertical shifts, and amplitude do **not** change the frequency.

Period T (seconds per cycle) is the reciprocal:

$$T = \frac{1}{f} = \frac{2\pi}{B}.$$

Checklist (quick)

1. Identify the coefficient B multiplying x inside the trig argument (make sure it's in radians).
2. Compute $f = \frac{B}{2\pi}$.
3. Optionally compute period $T = 1/f = \frac{2\pi}{B}$.
4. Phase shift and amplitude don't affect frequency.

Worked examples

Example A – $y = \sin(200\pi x)$

1. Inside is $200\pi x$ so $B = 200\pi$ (radians per second).
2. Frequency:

$$f = \frac{B}{2\pi} = \frac{200\pi}{2\pi} = 100 \text{ Hz}.$$

3. Period:

$$T = \frac{1}{f} = \frac{1}{100} = 0.01 \text{ seconds}.$$

Answer: $f = 100$ Hz, $T = 0.01$ s.

Example B – $f(x) = 2\cos(\pi x + 3) - 2$

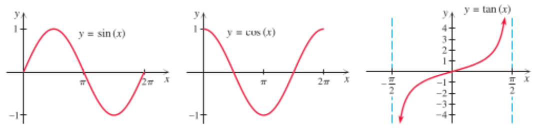
1. Inside is $\pi x + 3$. Factor: coefficient of x is $B = \pi$ (radians per second). The "+3" is a phase shift – it doesn't change frequency.
2. Frequency:

$$f = \frac{B}{2\pi} = \frac{\pi}{2\pi} = \frac{1}{2} = 0.5 \text{ Hz}.$$

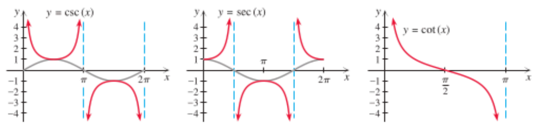
3. Period:

$$T = \frac{1}{f} = 2 \text{ seconds}.$$

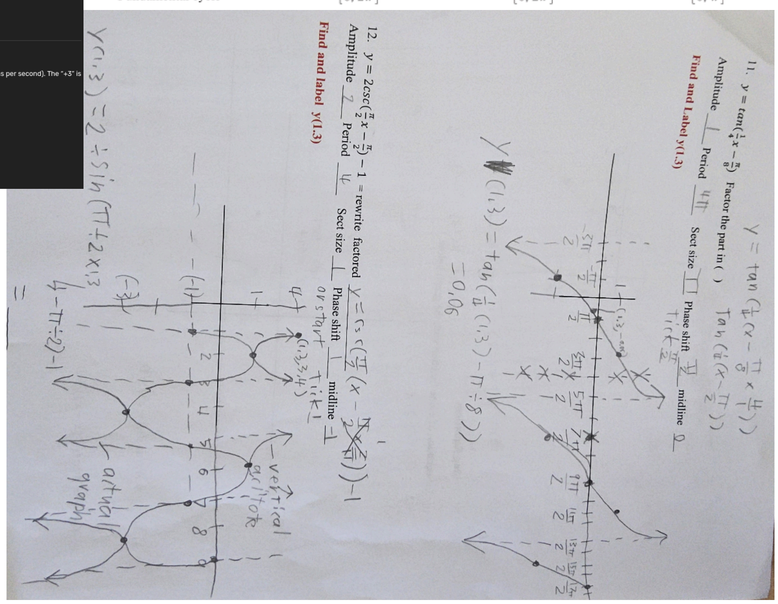
Answer: $f = 0.5$ Hz, $T = 2$ s.



	$y = \sin(x)$	$y = \cos(x)$	$y = \tan(x)$
Domain (k any integer)	$(-\infty, \infty)$	$(-\infty, \infty)$	$x \neq \frac{\pi}{2} + k\pi$
Range	$[-1, 1]$	$[-1, 1]$	$(-\infty, \infty)$
Period	2π	2π	π
Fundamental cycle	$[0, 2\pi]$	$[0, 2\pi]$	$\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$



	$y = \csc(x)$	$y = \sec(x)$	$y = \cot(x)$
Domain (k any integer)	$x \neq k\pi$	$x \neq \frac{\pi}{2} + k\pi$	$x \neq k\pi$
Range	$(-\infty, -1] \cup [1, \infty)$	$(-\infty, -1] \cup [1, \infty)$	$(-\infty, \infty)$
Period	2π	2π	π
Fundamental cycle	$[0, 2\pi]$	$[0, 2\pi]$	$[0, \pi]$



1. $y = 2\sin(3x - \frac{\pi}{4}) + 1$
   - Factor: $3x - \frac{\pi}{4} = 3(x - \frac{\pi}{12}) \to C = \frac{\pi}{12}$.
   - $A = 2. B = 3. D = 1.$
   - Period $= \frac{2\pi}{3}$. Section $= \frac{\pi}{6}$.
   - Phase shift: right $\frac{\pi}{12}$. Midline $y = 1$. Range $[-1, 3]$.
2. $y = -3\cos(\frac{1}{2}x + \frac{\pi}{6}) - 2$
   - Factor: $\frac{1}{2}x + \frac{\pi}{6} = \frac{1}{2}(x + \frac{\pi}{3}) \to C = -\frac{\pi}{3}$ (left $\frac{\pi}{3}$).
   - $A = 3$ (negative → reflection). $B = \frac{1}{2}. D = -2.$
   - Period $= \frac{2\pi}{1/2} = 4\pi$. Section $= \pi$.
   - Midline $y = -2$. Range $[-5, 1]$.
3. $y = 0.5\tan(2x - \frac{\pi}{3})$
   - Factor: $2x - \frac{\pi}{3} = 2(x - \frac{\pi}{6})$ → phase shift right $\frac{\pi}{6}$.
   - $A = 0.5$ (vertical stretch factor), $B = 2, D = 0$.
   - Period $= \frac{\pi}{2}$ (since tan: π/B). Section (use period/4 $= \pi/8$ if you want quarter points).
   - Vertical asymptotes: solve $2x - \frac{\pi}{3} = \frac{\pi}{2} + n\pi \to x = \frac{5\pi}{12} + \frac{n\pi}{2}$.
   - No midline shift (y=0).
4. $y = -2\cot(\frac{1}{3}x + \frac{\pi}{4}) + 2$
   - Factor: $\frac{1}{3}x + \frac{\pi}{4} = \frac{1}{3}(x + \frac{3\pi}{4}) \to C = -\frac{3\pi}{4}$.
   - $A = 2$ (negative → reflection), $B = \frac{1}{3}, D = 2$.
   - Period for cot: $\pi/B = 3\pi$. Section = $3\pi/4$.
   - Asymptotes: solve $\frac{1}{3}x + \frac{\pi}{4} = n\pi \to x = 3n\pi - \frac{3\pi}{4}$.
   - Midline $y = 2$.
5. $y = 4\sec(\frac{\pi}{6}x - \frac{\pi}{3}) - 1$
   - Factor: $\frac{\pi}{6}x - \frac{\pi}{3} = \frac{\pi}{6}(x - 2)$ → phase shift right 2.
   - $A = 4. B = \frac{\pi}{6}. D = -1.$
   - Period $= \frac{2\pi}{\pi/6} = 12$. Section = 3.
   - Asymptotes (cos = 0): $\frac{\pi}{6}(x - 2) = \frac{\pi}{2} + n\pi \to x - 2 = 3 + 6n \to \boxed{x = 5 + 6n}$.
   - Range: $(-\infty, -5] \cup [3, \infty)$.
6. $y = -\csc(\frac{2\pi}{5}x + \pi) + 1$
   - Factor: $\frac{2\pi}{5}x + \pi = \frac{2\pi}{5}(x + \frac{5}{2})$ → phase shift left 2.5 (i.e. $C = -2.5$).
   - A is effectively 1 (csc amplitude), $B = \frac{2\pi}{5}, D = 1$.
   - Period $= \frac{2\pi}{2\pi/5} = 5$. Section = 1.25.
   - Asymptotes (sin = 0): $\frac{2\pi}{5}(x + 2.5) = n\pi \to x = 2.5n - 2.5$. So asymptotes at $x = 2.5(n - 1)$ (or list: $\dots, -5, -2.5, 0, 2.5, 5, \dots$ depending on n).
   - Range: $(-\infty, 0] \cup [2, \infty)$? Wait – compute D ± |A|: midline 1, amplitude 1 → critical y-values for csc are $1 \pm 1 = 0$ and 2. Because leading minus flips sign, the actual finite extrema will be at $y = 0$ and $y = 2$, but csc never takes values strictly between 0 and 2. So range: $(-\infty, 0] \cup [2, \infty)$.