$$\frac{4 + 4\cos x}{4\sin x} = \frac{4\sin x}{4 - 4\cos x}$$

To graph, if you have no graphing calculator, DESMOS and/or Wolframalpha.com or

(4+4*cos(x))/4*sin(x) will graph

$$\left(\frac{4+4\cos(x)}{4}\right)\sin(x)$$

Need parentheses around entire denominator.

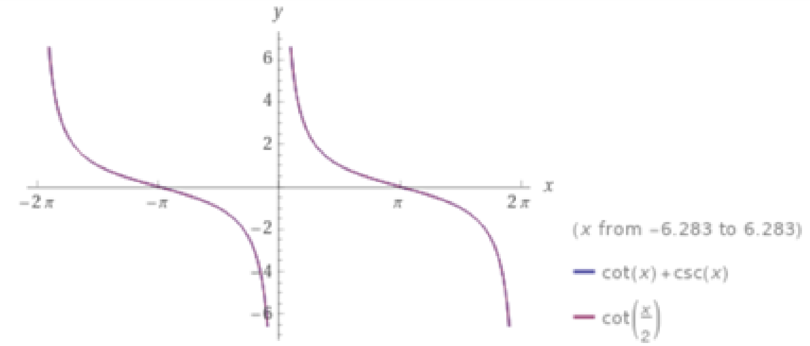


TABLE SETUP
TblStart=-3π
ΔTbl=1
Indpnt: Auto Ask
Depend: Auto Ask

X	Y1	Y2
-3.000	-38.19	-38.19
-2.000	-57.29	-57.29
-1.000	-114.6	-114.6
0.0000	ERR:	ERR:
1.0000	114.59	114.59
2.0000	57.290	57.290
3.0000	38.188	38.188

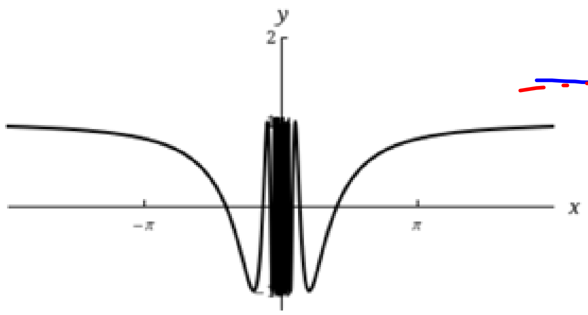
X= -3

0/9 points

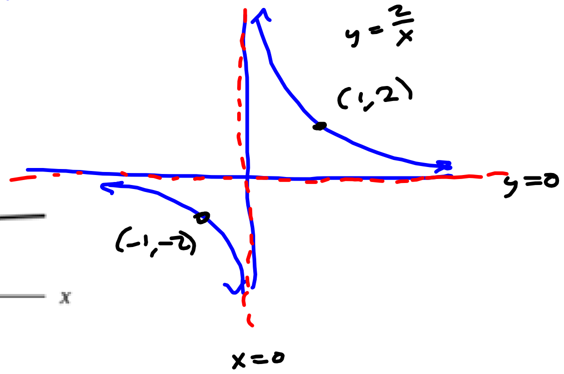
Consider the function

$f(x) = \cos\left(\frac{2}{x}\right) = \cos\left(\frac{2}{x}\right)$

and its graph shown in the figure.



Look @ $y = \frac{2}{x}$ = the input to $\cos\left(\frac{2}{x}\right)$



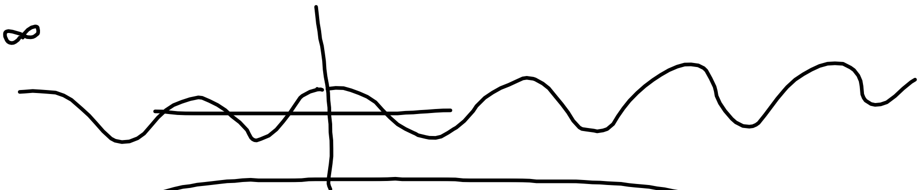
As x approaches 0 $(x \to 0)$, $\frac{2}{x}$ is...

... approaching $-\infty$ from the left and

... " $+\infty$ " " right.

$$\lim_{x \to 0^-} \left(\frac{2}{x}\right) = -\infty$$

$$\lim_{x \to 0^+} \left(\frac{2}{x}\right) = +\infty$$



$\frac{2}{x} \xrightarrow{x \to \infty} 0$

$\frac{2}{x} \xrightarrow{x \to -\infty} 0$

As $\star \to 0$, $\cos(\star) \to 1$

$$\lim_{\star \to 0} \cos(\star) = 1$$

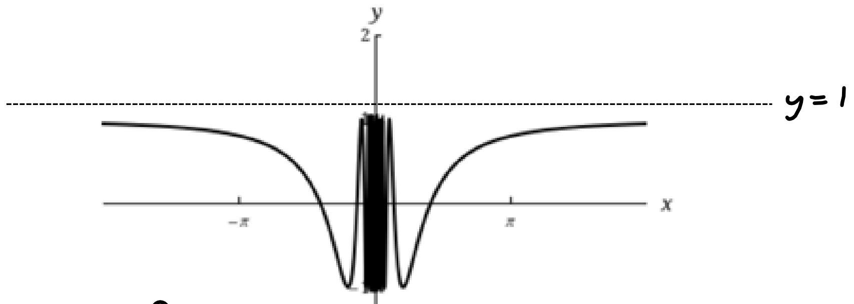
→ Horizontal Asymptote

47. 0/9 points

Consider the function

$f(x) = \cos \frac{2}{x}$

and its graph shown in the figure.



Domain of the Composition $f \circ g$

$\mathcal{D}(f) = \{x \mid f(x) \text{ is defined}\}$

$\mathcal{D}(f \circ g) = \{x \mid g(x) \text{ is defined and } g(x) \in \mathcal{D}(f)\}$

↳ Inside function has to eat it.

↳ outside function has to eat what g(x) puts out.

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

$g(x) = \frac{2}{x}$

$(f \circ g)(x) = f(g(x)) = \cos\left(\frac{2}{x}\right)$

$\mathcal{D}(f \circ g) = \{x \mid x \in \mathcal{D}(\frac{2}{x}) \text{ and } \frac{2}{x} \in \mathcal{D}(\text{cosine})\}$

$\mathcal{D}$(cosine) = All real #s. So it comes down to $\frac{2}{x}$ being defined:

$\mathcal{D}\left(\frac{2}{x}\right) = \mathbb{R} \setminus \{0\} = (-\infty, 0) \cup (0, \infty)$

↳ Me ↳ WebAssign

Symmetry of $\cos\left(\frac{2}{x}\right)$

$\frac{2}{x}$ is odd

Let $u = \frac{2}{x}$. We're looking @ $\cos(u)$

Cosine is even, so $\cos(-u) = \cos(u)$

That's symmetry about y-axis.

WebAssign S2.3 # 47 says

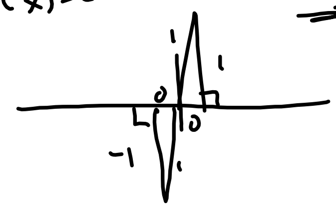
$\cos\left(\frac{2}{x}\right)$ has an asymptote $x=0$.

But $\cos(*)$ has range $[-1, 1]$

So V.A. doesn't make sense

Solve $\cos\left(\frac{2}{x}\right)=0$

$\cos\left(\frac{2}{x}\right)=0$



$\Rightarrow \frac{2}{x}=\frac{\pi}{2}, \quad \frac{2}{2}x=\frac{3\pi}{2}$

$\frac{2}{x}=\frac{\pi}{2}+2n\pi = \frac{\pi}{2}+\frac{4n\pi}{2}=\frac{(4n+1)\pi}{2}$

$\Rightarrow \frac{2}{x}=\frac{(4n+1)\pi}{2}=\frac{2}{x}$

(Cross-multiply)

$(4n+1)\pi x = 4$

$\Rightarrow x = \frac{4}{(4n+1)\pi}$

$\frac{2}{x}=\frac{3\pi}{2}+2n\pi = \frac{3\pi+4n\pi}{2}$

$=\frac{(4n+3)\pi}{2}=\frac{2}{x}$

$(4n+3)\pi x = 4$

$x=\frac{4}{(4n+3)\pi}$

Solution Set: $\left\{x \mid x=\frac{4}{(4n+3)\pi} \text{ OR } \frac{4}{(4n+1)\pi}, n\in\mathbb{Z}\right\}$

Mills answer.

Not like the book?!

Not a problem.

$\frac{2}{x}=\frac{\pi}{2}, \frac{3\pi}{2}$ are π apart.

So $\frac{2}{x} = \frac{\pi}{2} + n\pi$ captures $\frac{\pi}{2}$'s & $\frac{3\pi}{2}$'s

& do what we just did:

$$\frac{2}{x} = \frac{\pi + 2n\pi}{2} \Rightarrow$$

$$4 = (\pi + 2n\pi)x$$

$$\frac{4}{\pi + 2n\pi} = x$$

Written Answer:

Sol'n Set: $\left\{ x \;\middle|\; x = \frac{4}{\pi + 2n\pi},\ n \in \mathbb{Z} \right\}$

WebAssign

Biggest One?

$\frac{4}{\pi}$ (Let $n=0$)

$$\frac{3}{5} > \frac{3}{7}$$

Verify the identity by converting the left side into sines and cosines. (Simplify at each step.)

$$\frac{\cot^2(t)}{\csc(t)} = \frac{1 - \sin^2(t)}{\sin(t)}$$

$$\frac{\cot^2(t)}{\csc(t)} = \frac{(\cot(t))^2}{\csc(t)} = \frac{\left(\frac{\cos(t)}{\sin(t)}\right)^2}{\frac{1}{\sin(t)}} = \frac{\frac{(\cos(t))^2}{(\sin(t))^2}}{\frac{1}{\sin(t)}} = \frac{\frac{\cos^2(t)}{\sin^2(t)}}{\frac{1}{\sin(t)}}$$

$$= \frac{\cos^2(t)}{\sin^2(t)} \cdot \frac{\sin(t)}{1} = \frac{\cos^2(t)\sin(t)}{\sin^2(t)} = \frac{\cos^2(t)}{\sin(t)} = \frac{1 - \sin^2(t)}{\sin(t)}$$

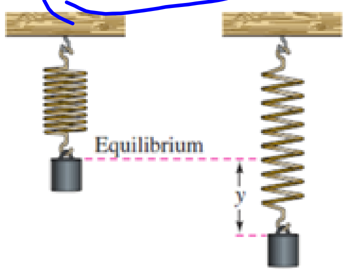
$\cot(t) = \frac{\cos(t)}{\sin(t)}$, $\cos^2(t) = 1 - \sin^2(t)$

A weight is oscillating on the end of a spring (see figure). The displacement from equilibrium of the weight relative to the point of equilibrium is given by

$$y = \frac{1}{12}(\cos(8t) - 4\sin(8t))$$

where y is the displacement (in meters) and t is the time (in seconds). Find the times when the weight is at the point of equilibrium $(y = 0)$ for $0 \le t \le 1$. (Enter your answers as a comma-separated list. Round your answers to two decimal places.)

$t =$ [ ] ✗ 0.03, 0.42, 0.82 s



Let y = Displacement from equilibrium in meters, as a function of

t = time, in seconds

We are given:

$$y = \frac{1}{12}(\cos(8t) - 4\sin(8t))$$

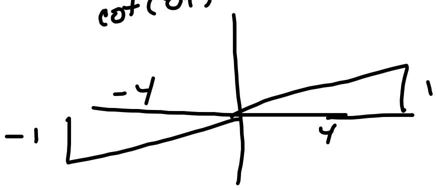
We find all $t \in [0,1]$ such that $y = y(t) = 0$.

$$y = \frac{1}{12}(\cos(8t) - 4\sin(8t)) \overset{SET}{=} 0$$

$$\Rightarrow \cos(8t) - 4\sin(8t) = 0$$

$$\Rightarrow \cos(8t) = 4\sin(8t)$$

$$\Rightarrow \frac{\cos(8t)}{\sin(8t)} = \cot(8t) = 4$$



$$\Rightarrow \tan(8t) = \frac{1}{4}$$

$$\arctan(\tan(8t)) = \arctan\left(\frac{1}{4}\right)$$

$$8t = \arctan\left(\frac{1}{4}\right)$$

$t = \frac{1}{8}\arctan\left(\frac{1}{4}\right)$ is ONE SOL'N.

We want ALL $t \in [0,1] \ni \tan(8t) = \frac{1}{4}$

$$0 \le t \le 1 \Rightarrow$$

$$0 \le 8t \le 8$$

Ask me?