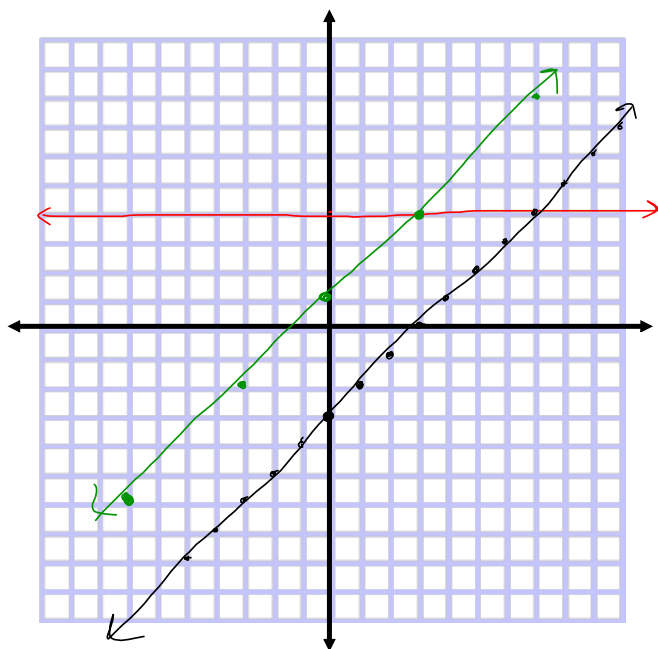


Bell Work



given: $f(x) = 4$

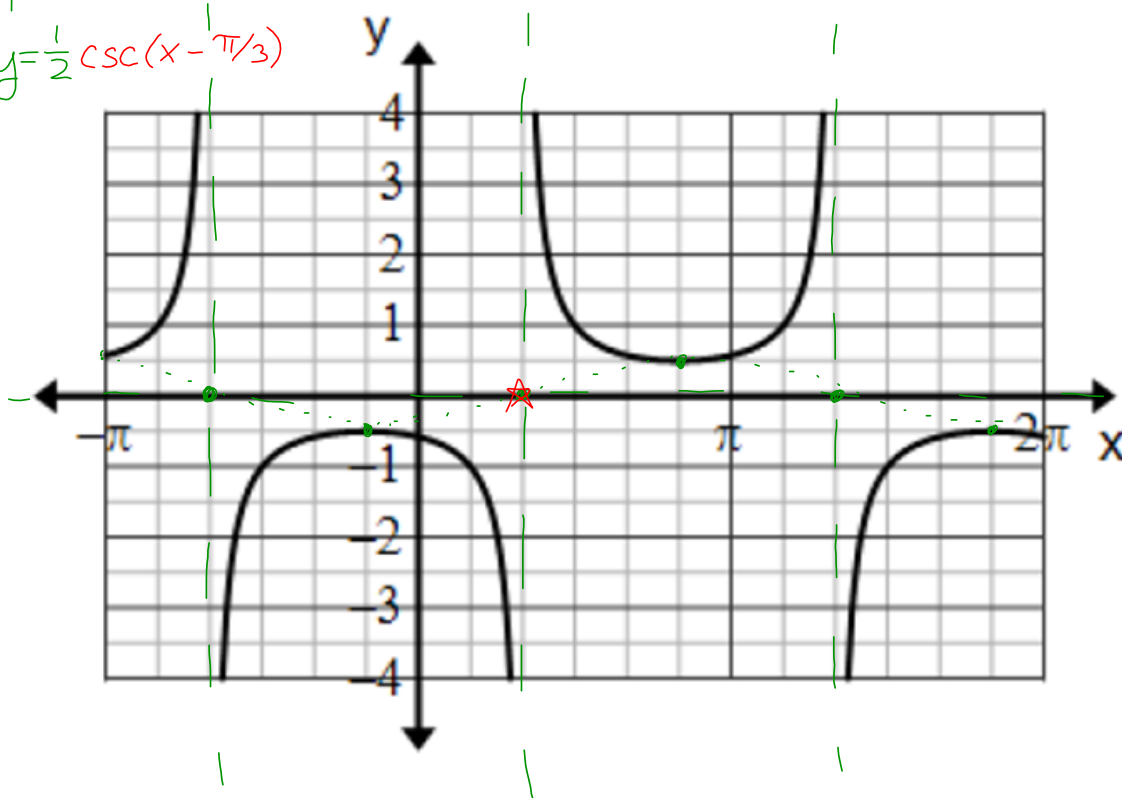
$g(x) = x - 3$

find: $f(x) + g(x) = x + 1$

Algebraically &
graphically

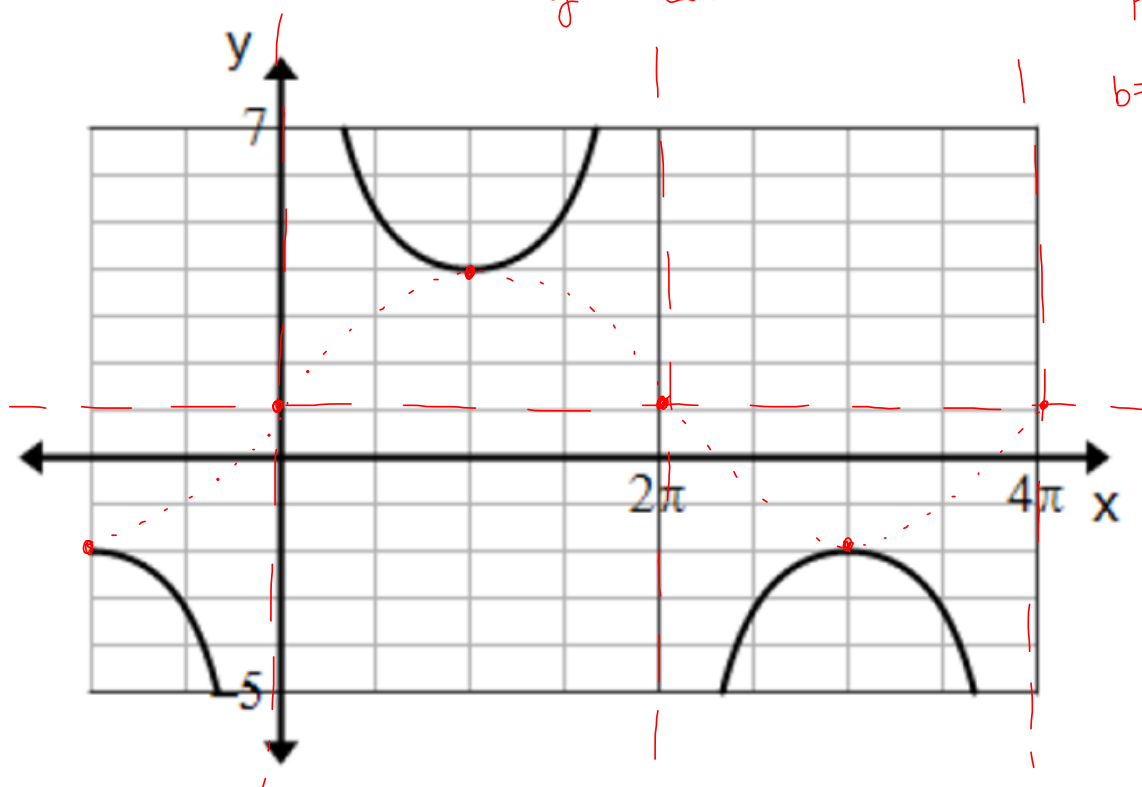
period: 2π

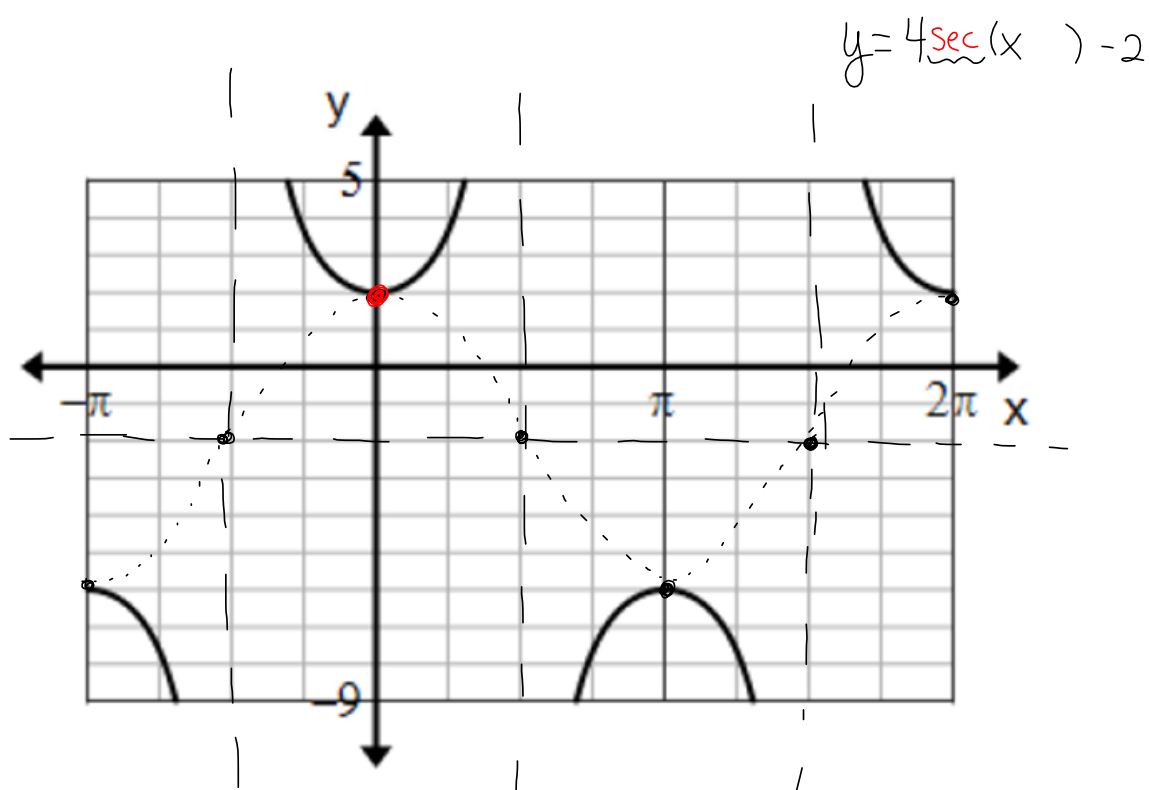
$$y = \frac{1}{2} \csc\left(x - \frac{\pi}{3}\right)$$

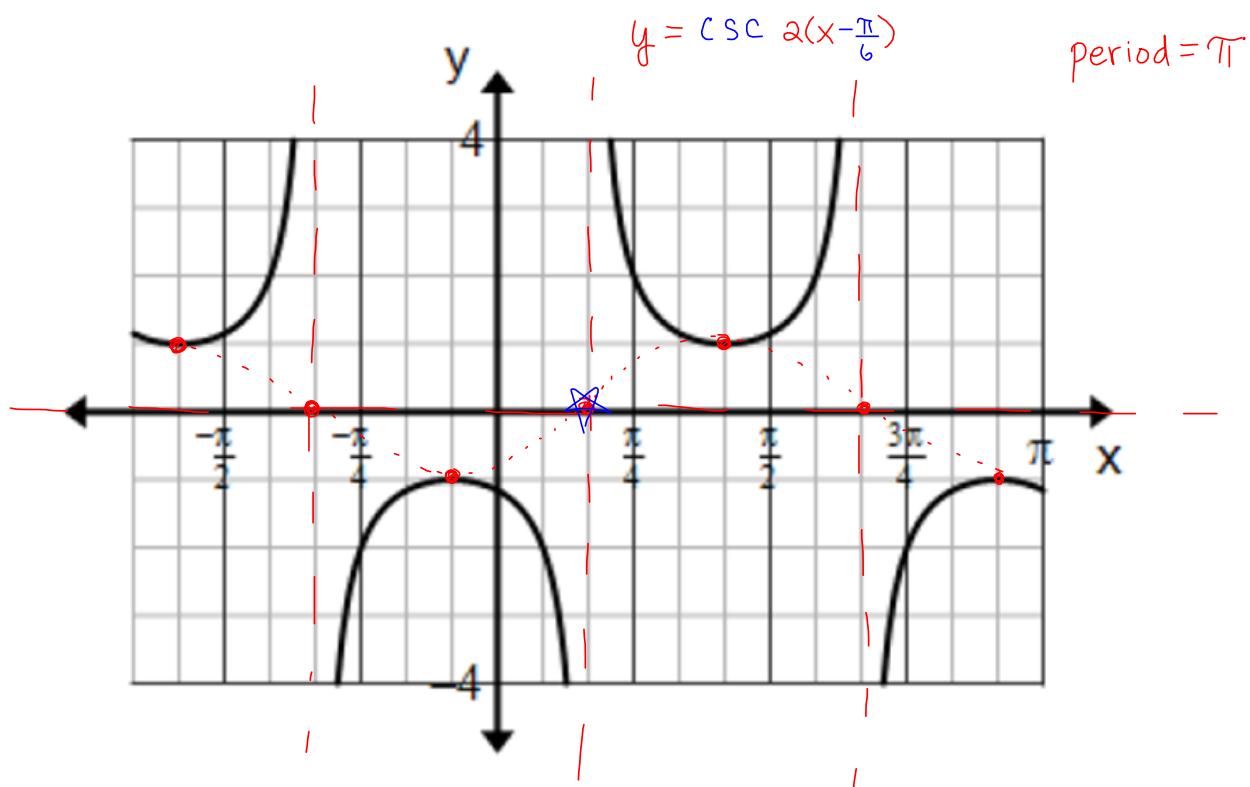


$$y = 3 \csc \frac{1}{2}(x) + 1$$

period 4π
 $b = \frac{1}{2}$





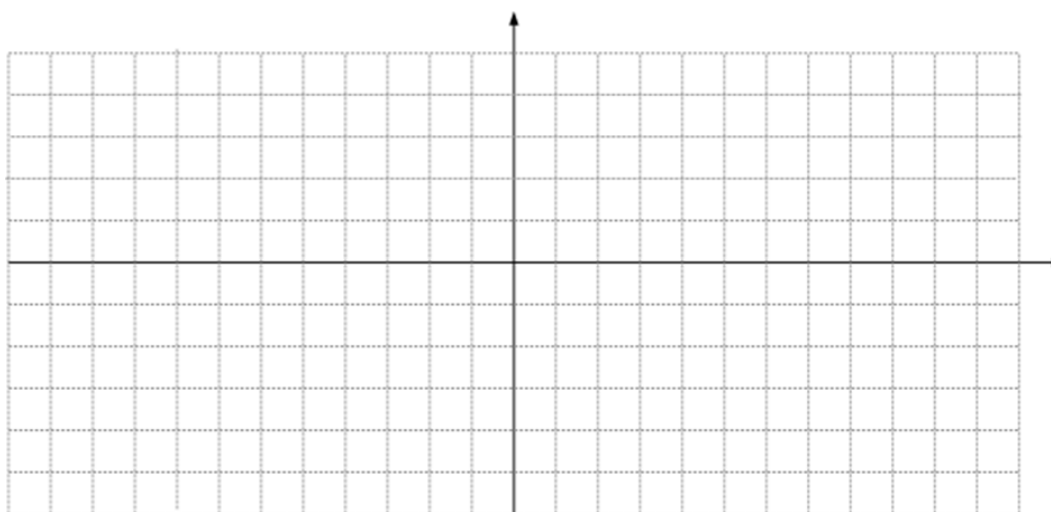


Quiz 4.5 A

Name _____

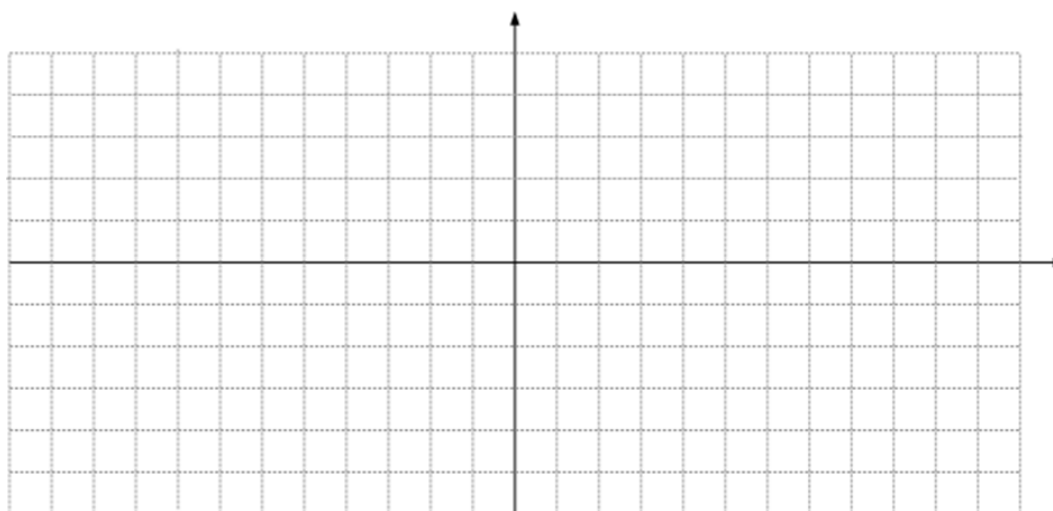
1) Graph

$$y = -1 + 2\sec x$$



2) Graph

$$y = -2\tan x$$

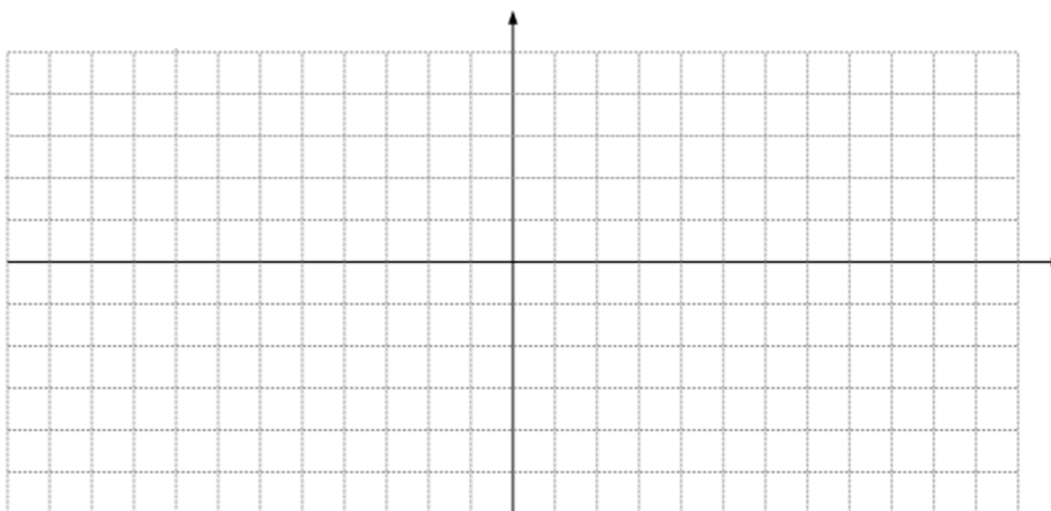


Quiz 4.5 B

Name _____

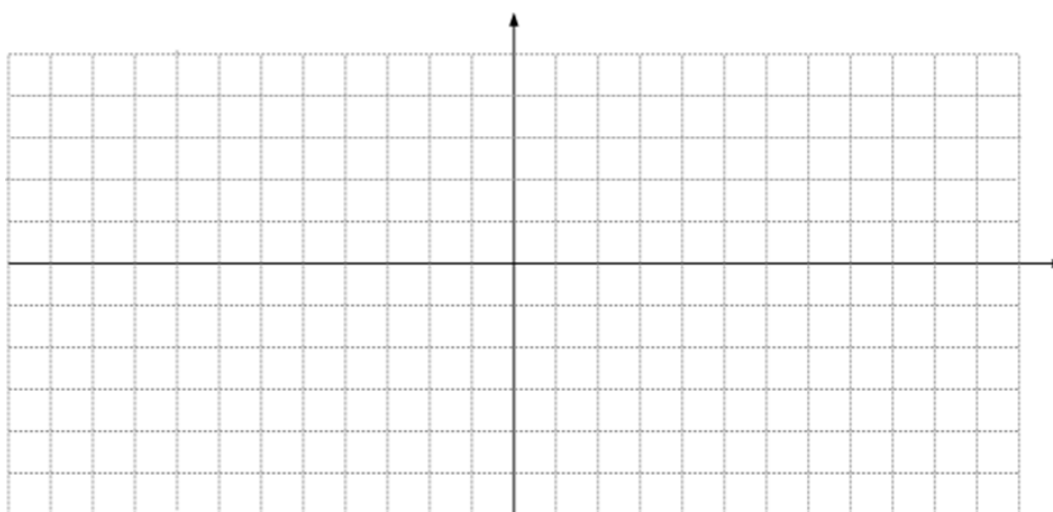
1) Graph

$$y = -1 + 2\csc x$$



2) Graph

$$y = 2\cot x$$



What happens when you combine the Sine function with x^2 ?

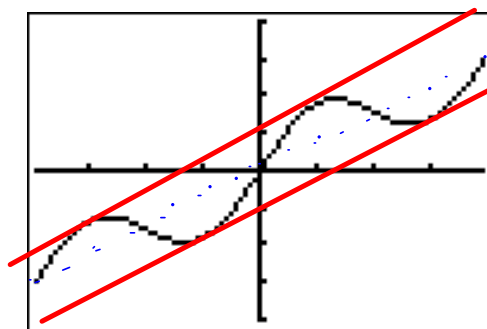
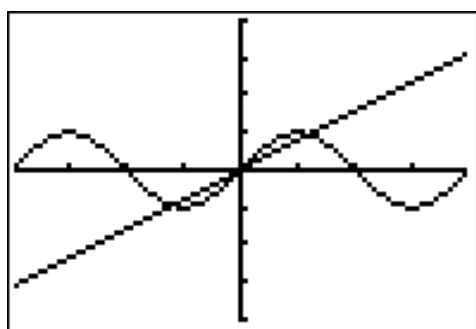
Which graphs appear to be periodic?

- a) $y = \sin x + x^2$
- b) $y = x^2 \sin x$
- c) $y = (\sin x)^2$ or $y = \sin^2 x$
- d) $y = \sin(x^2)$

When a sinusoid is added to a (nonconstant) linear function, the result is not periodic

$$f(x) = .5x + \sin x$$

$$y = .5x + 1$$
$$y = .5x - 1$$



What 2 lines does the picture oscillate between?

Find the equation of the 2 lines that the graph oscillates between.

$$y = \underbrace{1 + x}_{\text{max } 1} + \underbrace{\cos 3x}_{\text{min } -1}$$

$$y = 1 + x + 1 \quad y = x + 2$$

$$y = 1 + x + -1 \quad y = x$$

Sums and differences of sinusoids with the same period are sinusoids and have the same period as the originals.

a) $f(x) = 5\underbrace{\cos x} + 3\underbrace{\sin x}$ Period 2π Sinusoid

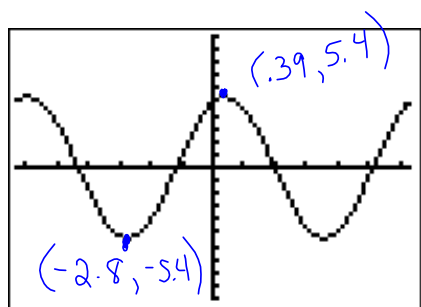
b) $f(x) = \cos\underbrace{5x} + \sin\underbrace{3x}$ different periods not sinusoid

c) $f(x) = 2\cos 3x - 3\cos 2x$ Not sinusoid

d) $f(x) = a \cos(\frac{3x}{7}) - b \cos(\frac{3x}{7}) + c \sin(\frac{3x}{7})$ sinusoid
 period: $\frac{2\pi}{\frac{3}{7}} = \frac{14\pi}{3}$

Given $f(x) = 2\sin x + 5\cos x$

- find the period 2π
- Estimate the amplitude and phase shift graphically
- write an equation

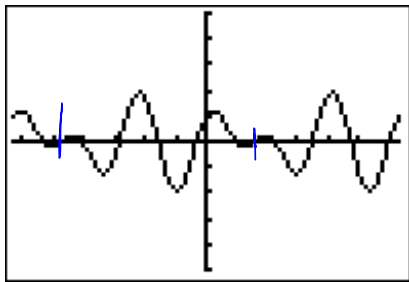


$$y = 5.4 \cos(x - 3.9)$$

Showing a function is Periodic but not a sinusoid

$$f(x) = \sin 2x + \cos 3x$$

$\underbrace{\sin 2x}_{\text{period} \Rightarrow 2\pi} + \cos 3x$



$$\sin 2x \Rightarrow \frac{2\pi}{2} = \pi$$

$$\pi, 2\pi, 3\pi, 4\pi \dots$$

$$\cos 3x \Rightarrow \frac{2\pi}{3}$$

$$\frac{2\pi}{3}, \frac{4\pi}{3}, \frac{6\pi}{3}$$

$$\frac{2\pi}{3} + \frac{2\pi}{3}$$

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

the period is the LCM

Damped Oscillation

The graph of $y = f(x)\cos x$ or $y = f(x)\sin x$ oscillates between the graphs of $y = f(x)$ and $y = -f(x)$. $f(x)$ is called the damping factor.

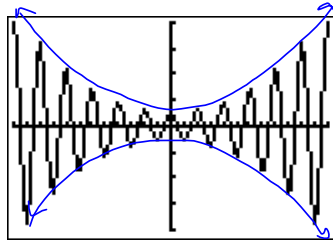
they can damp in 2 directions

$$x \rightarrow \infty \quad \text{or} \quad x \rightarrow 0$$

What is the damping factor and which direction is the damping effect.

$$y = (x^2 + 5)\cos 6x$$

$$y = x^2 + 5$$



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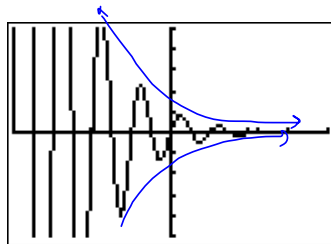
WINDOW
Xmin=-6.283185...
Xmax=6.2831853...
Xscl=.26179938...
Ymin=-40
Ymax=40
Yscl=10
Xres=1

```

$$f(x) = 2^{-x}\sin 4x$$

$$y = 2^{-x}$$

$$y = -2^{-x}$$



```

WINDOW
Xmin=-6.283185...
Xmax=6.2831853...
Xscl=1.5707963...
Ymin=-5
Ymax=5
Yscl=1
Xres=1

```



$$f(x) = 3\cos 2x \quad \text{No damping}$$

$$y = -2x\cos x \quad x \rightarrow 0$$

Assignment:

Pg. 411

QR: 1-8

EX: 1-7odd, 19, 21, 39-69odd, 77, 79, 83-85

