MA110. F. 10/28

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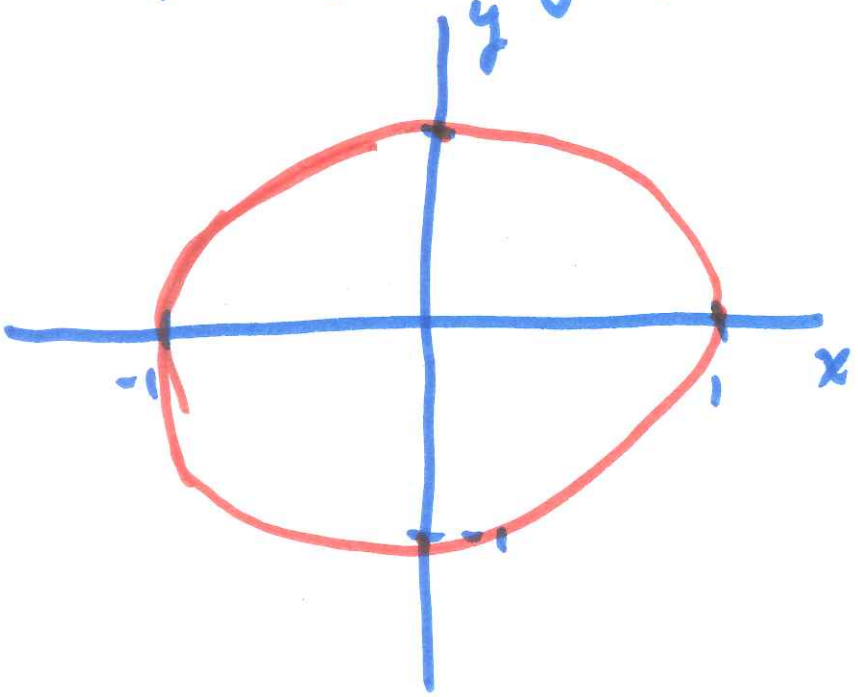
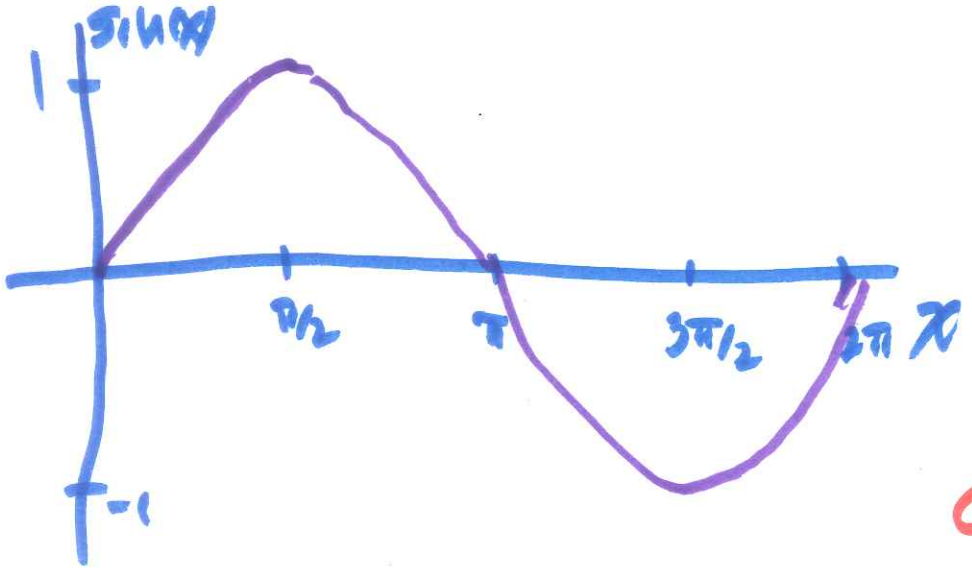
Graphs of trig functions

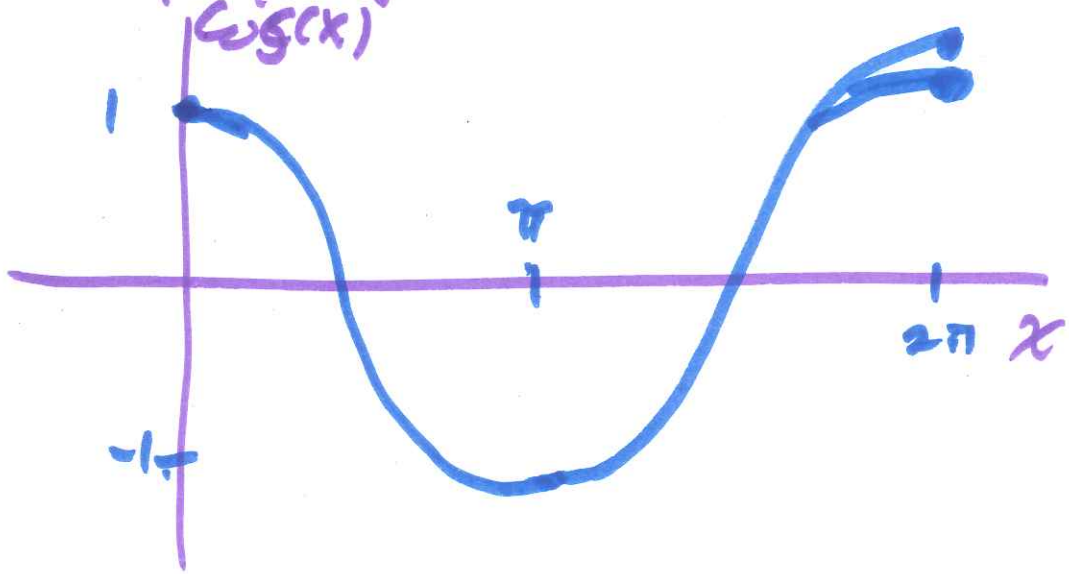


x	$\sin(x)$ (y-coord)
0	0
$\pi/6$	$1/2$
$\pi/4$	$\sqrt{2}/2 \approx 0.707$
$\pi/3$	$\sqrt{3}/2 \approx 0.866$
$\pi/2$	1
$2\pi/3$	$\sqrt{3}/2$
$3\pi/4$	$\sqrt{2}/2$
$5\pi/6$	$1/2$
π	0
$7\pi/6$	$-1/2$
$5\pi/4$	$-\sqrt{2}/2$
$4\pi/3$	$-\sqrt{3}/2$
$3\pi/2$	-1
$5\pi/3$	$-\sqrt{3}/2$
$7\pi/4$	$-\sqrt{2}/2$
$11\pi/6$	$-1/2$
2π	0



As we go around the circle once, the x-coordinate is 0.3 2 times.

Graphy $y = \cos(x)$



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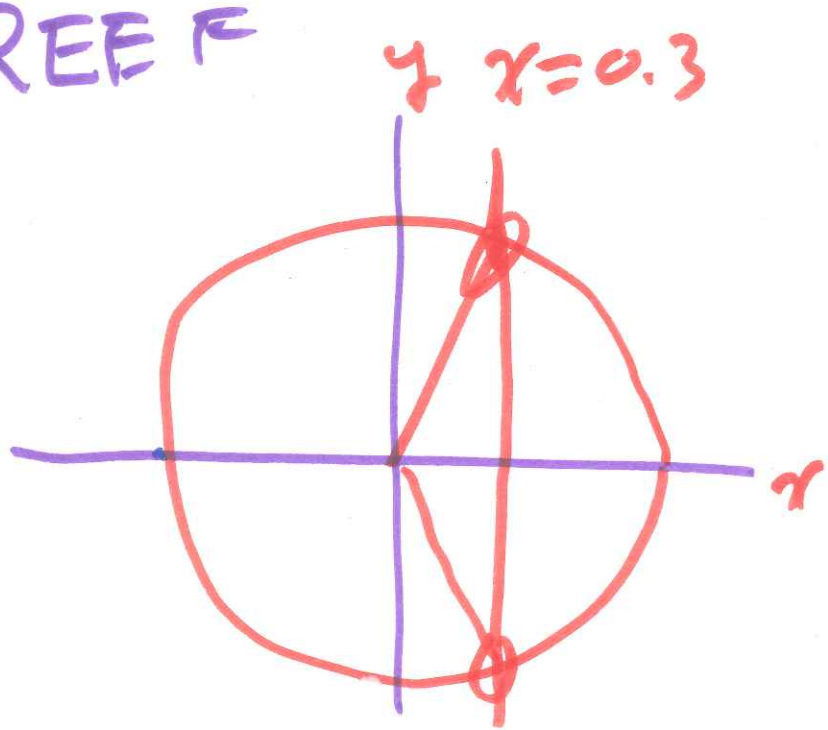


The graph repeats on the interval $[2\pi, 4\pi]$, $[4\pi, 6\pi]$, $[-2\pi, 0]$ ...

Domain + range of sin, cos.

sin has domain $(-\infty, \infty)$, range is $[-1, 1]$.

cos. domain $(-\infty, \infty)$ range is $[-1, 1]$

Definition A function is periodic w/ period p, if $f(t+p) = f(t)$ for all t.

Example. The functions sin and cos are periodic of period 2π.

Definition. Amplitude.

For the function $f(x) = A\sin(x)$ (or $A\cos(x)$).

the amplitude is $|A|$.

Example

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

amplitude is 1.

Question

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

What is the amplitude?

Find the amplitude & period for

~~f(x) = -2 sin(3x)~~

$f(t) = -2\cos(3t)$.

Amplitude is 2.

Period Pass thru one period on

$0 \le 3t \le 2\pi$

or $0 \le t \le 2\pi/3$.

Period is $2\pi/3$.

$f(x) = -2\sin(3x+5)$.

Find period & amplitude.

Amplitude is 2.

Period is x with

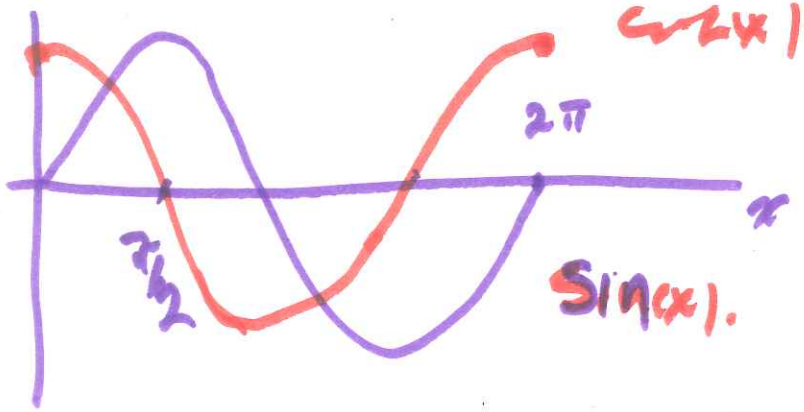
$0 \le 3x \le 2\pi$

$0 \le x \le 2\pi/3$.

$y = \tan(x) = \frac{\sin(x)}{\cos(x)} = \frac{\sin(x)}{\cos(x)}$

Period of tangent.

is π



Domain is x such that $\cos(x) \neq 0$.

or $x \neq \pm\pi/2, \pm\frac{3\pi}{2}, \pm\frac{5\pi}{2} \ldots$

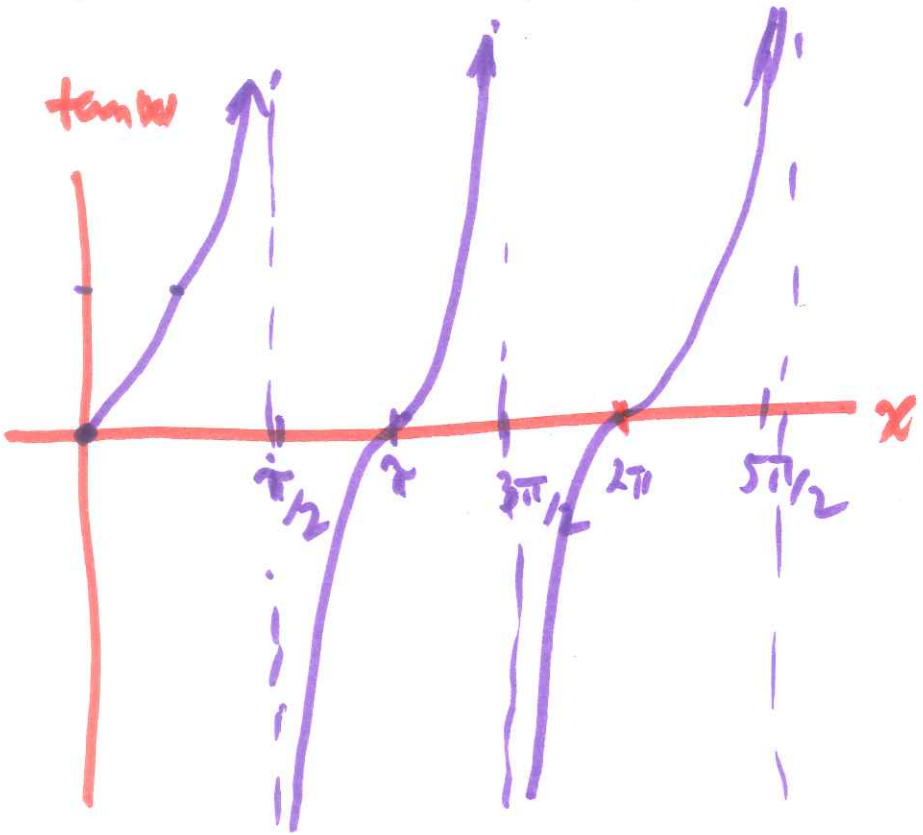
Range $(-\infty, \infty)$

Graphing and transformations

Graph $y = \sin(3x)$.

By Starting w/ $y = \sin(x)$

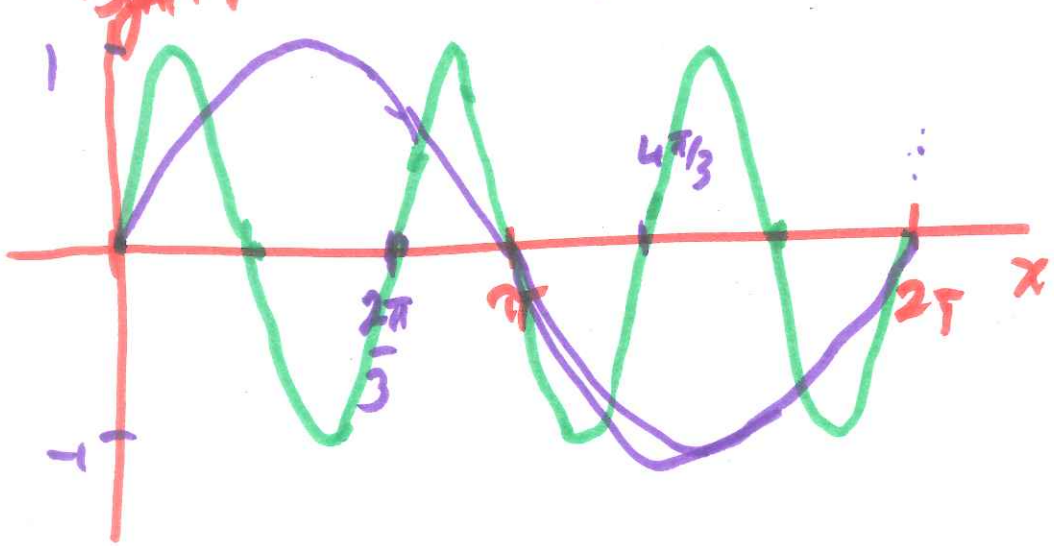
& applying a transformation.



Solution. $\sin(x)$ has a period 2π

$\sin(3x)$ has period $2\pi/3$.

Compress the graph $y = \sin(x)$ horizontally by a factor of 3.



$y = \sin(3x)$ is the green graph.

What transformations do we need to graph

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

starting from $y = \sin(x)$.

Period is x s.t.

$0 \le x/3 \le 2\pi$.

$0 \le x \le 6\pi$

Ω 6π.

1. Stretch horiz. by a factor of 3.
2. Stretch vertically by a factor of 2

3. Reflect in y-axis