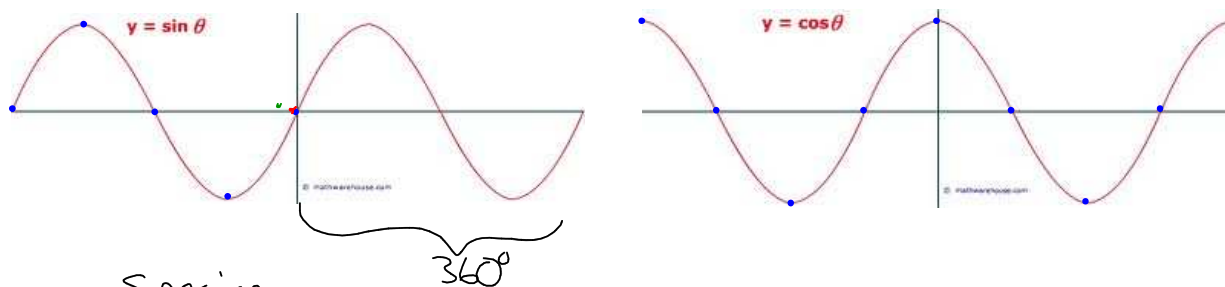


5.3 Stretches of Periodic Functions

To sketch sine and cosine functions, remember the 5 key points: Maximum, Minimum, and zeroes. These 5 points are equally spaced along the x-axis, so they divide the period into quarters.

spacing = period / 4



Spacing
 $\frac{360^\circ}{4} = 90^\circ$

Explore transformations...

Vertical Compressions and stretches

Given $y = af(x)$, when :

$|a| > 1$ vertical stretch

$0 < |a| < 1$ vertical compression

$a < 0$ reflection over x-axis

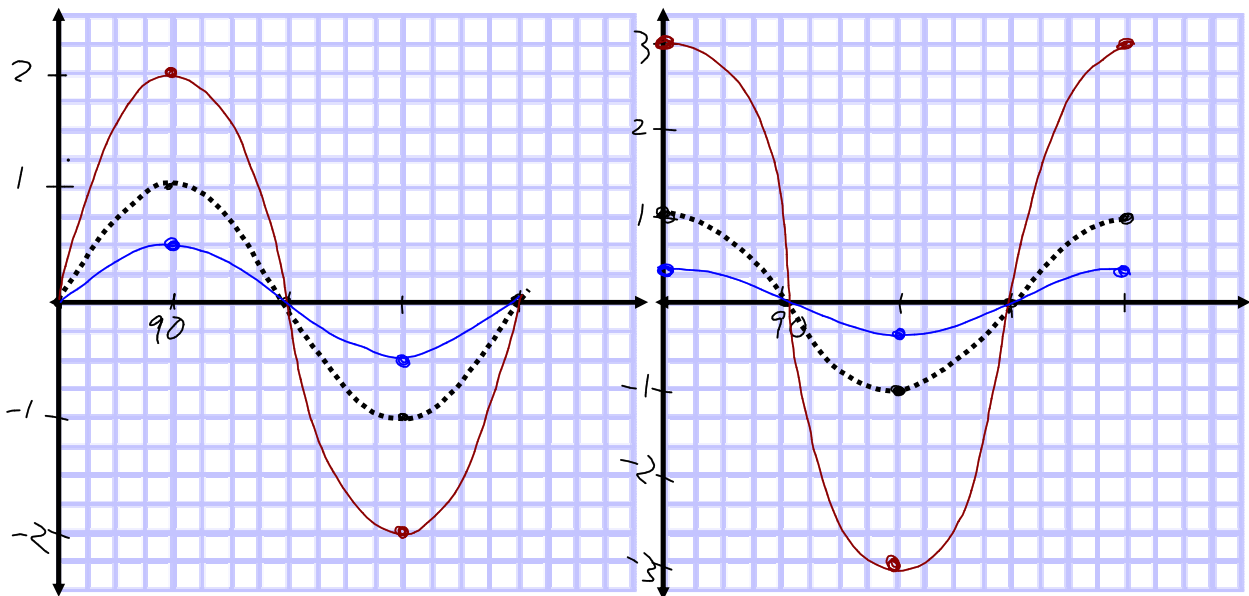
"a" is called the amplitude



Ex 1 Sketch the following for one full cycle.

- a) $y = 2\sin x$
- b) $y = 1/2\sin x$

- c) $y = 3\cos x$
- d) $y = 1/3\cos x$



For the above examples:
 Does the amplitude change? YES
 Does the period change? NO

Horizontal Stretches or Compressions

Given $y = f(kx)$, when:

$ k > 1$	<u>horz. compression</u>
$0 < k < 1$	<u>horz. stretch</u>
$k < 0$	<u>reflection in y-axis</u>

Remember, k is **INSIDE** the function and behaves **OPPOSITE** from what you would expect.

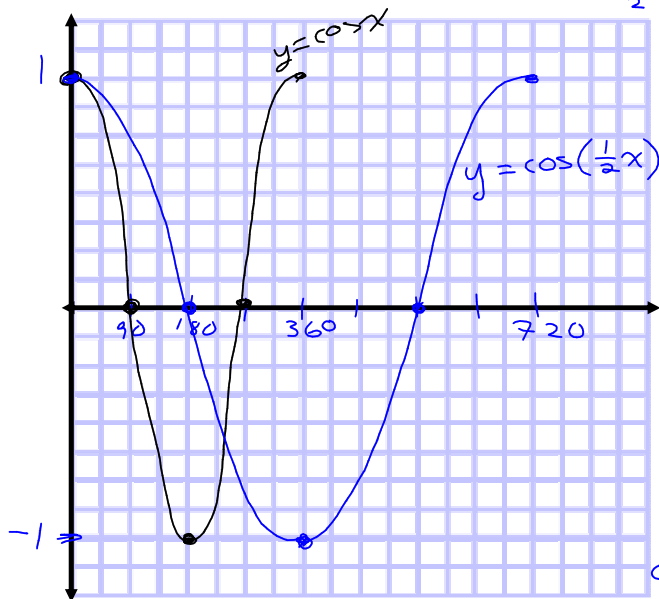
Because you are stretching/compressing horizontally, the period would change.

$$\text{PERIOD} = \frac{360^\circ}{k}$$

Ex 2 Sketch the following for one full cycle.

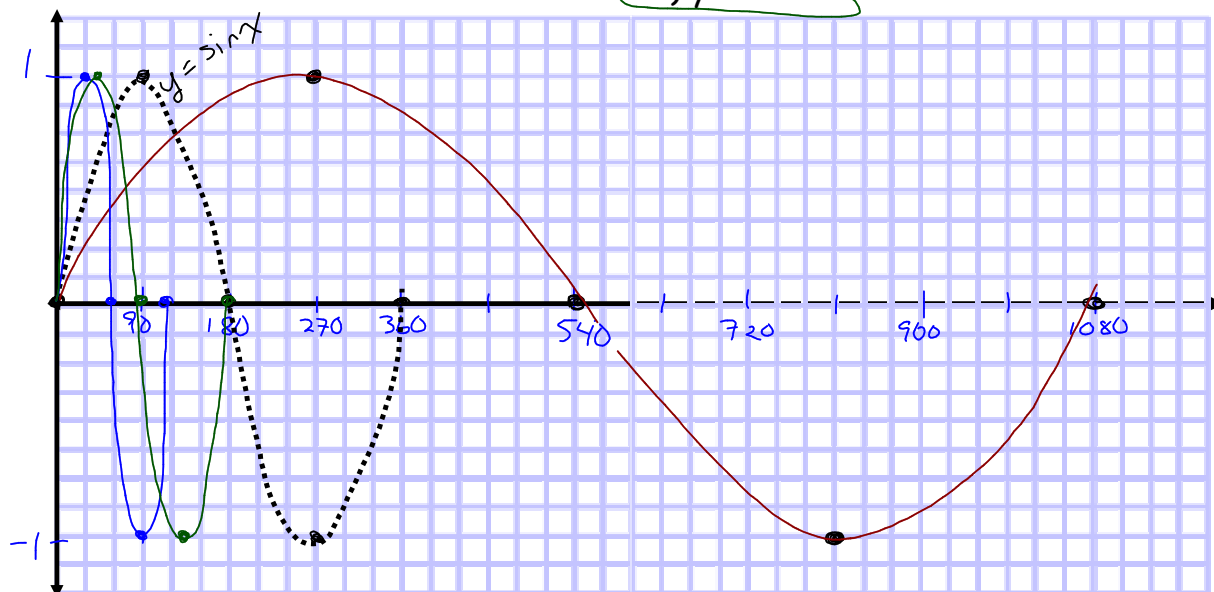
a) $y = \cos(1/2 x)$ — period $\frac{360}{\frac{1}{2}} = 720$

\therefore spacing $\frac{720}{4} = 180$



For these examples:
 Does the amplitude change? NO
 Does the period change? YES

- b) $y = \sin(1/3 x)$
- c) $y = \sin(3x)$
- d) $y = \sin(2x)$



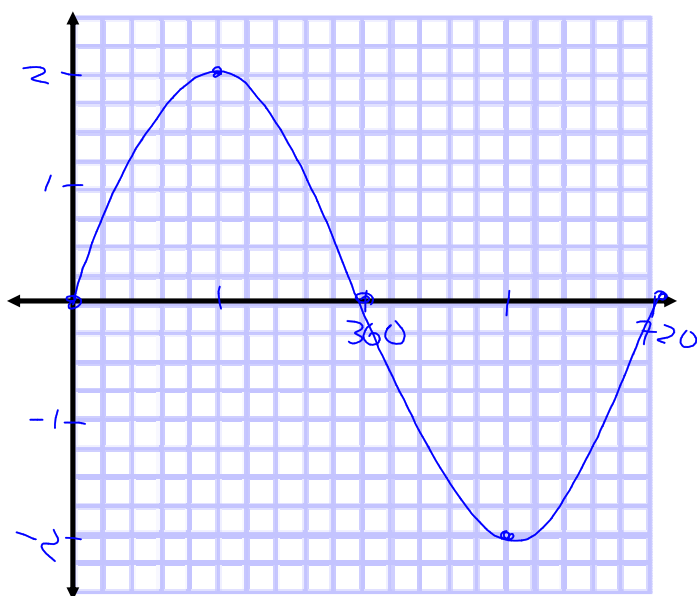
Ex 3 Graph one cycle of $y = 2\sin\left(\frac{1}{2}x\right)$

V.S.
of 2

H.S.
of 2

Amplitude: 2

Period: 720



Spacing: $\frac{720}{4}$
= 180

Homework - Handout 5.5 Stretches of Periodic Functions

1-12 eoo

note this handout is the same as
text book p 374
but text uses radians
 π radians = 180°

