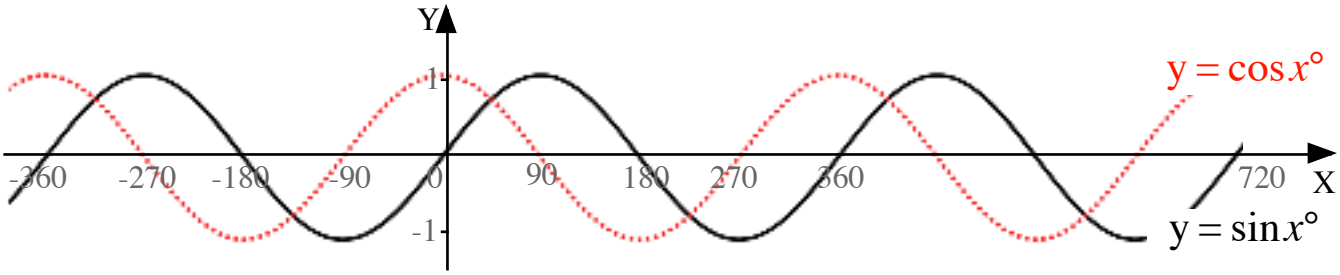
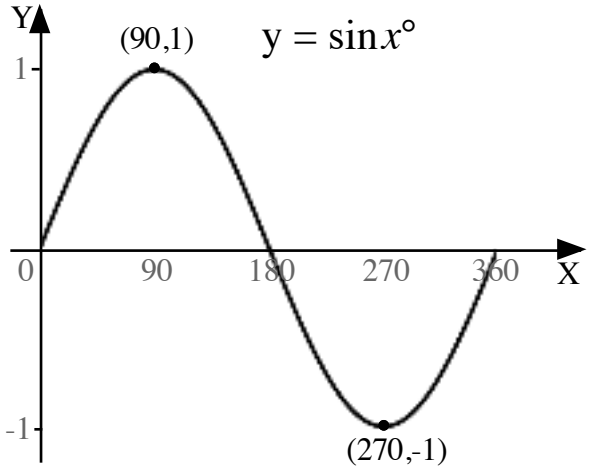
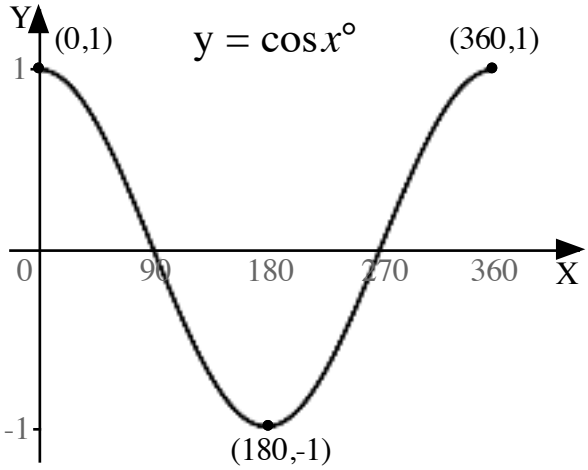
CHAPTER 17: TRIGONOMETRY: GRAPHS & EQUATIONS

The cosine graph is the sine graph shifted 90° to the left.



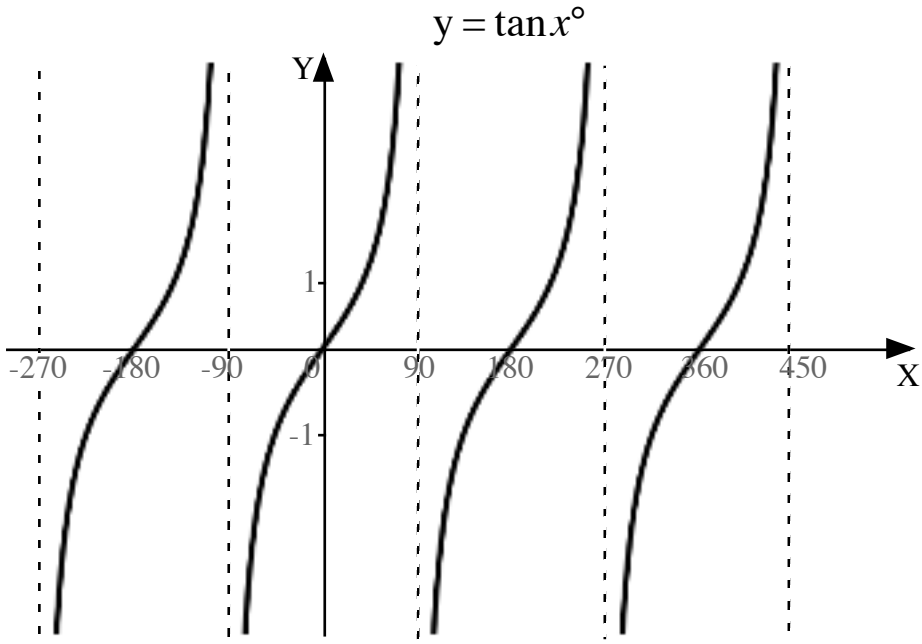
The graphs have a PERIOD of 360° (repeat every 360°).





Turning points:
maximum (90,1) , minimum (270,-1)

maximum (0,1) , minimum (180,-1)

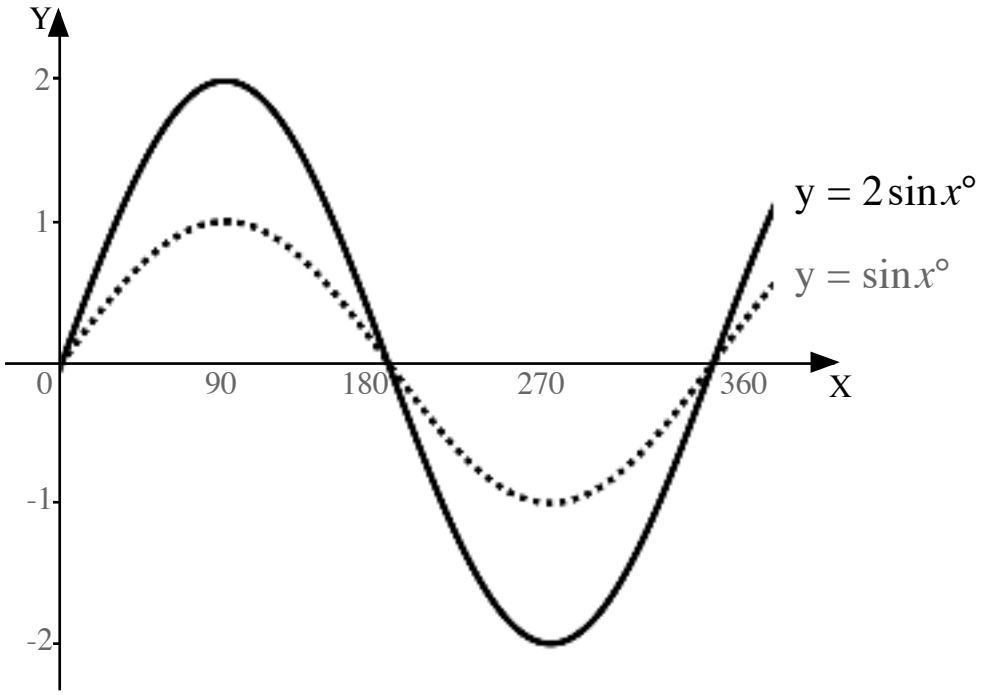


The tangent graph has a PERIOD of 180°.

TRANSFORMATIONS Same rules for $y = \sin x°$ and $y = \cos x°$.

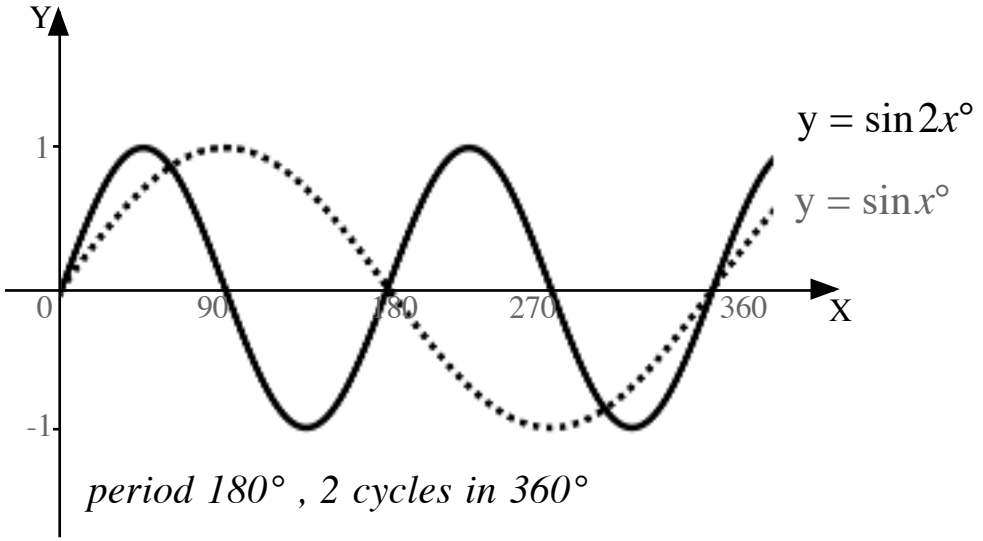
Y-STRETCH $y = \mathbf{n}\sin x°$ y-coordinates multiplied by **n**.
amplitude **n** units
maximum value $+\mathbf{n}$, minimum value $-\mathbf{n}$

(1)



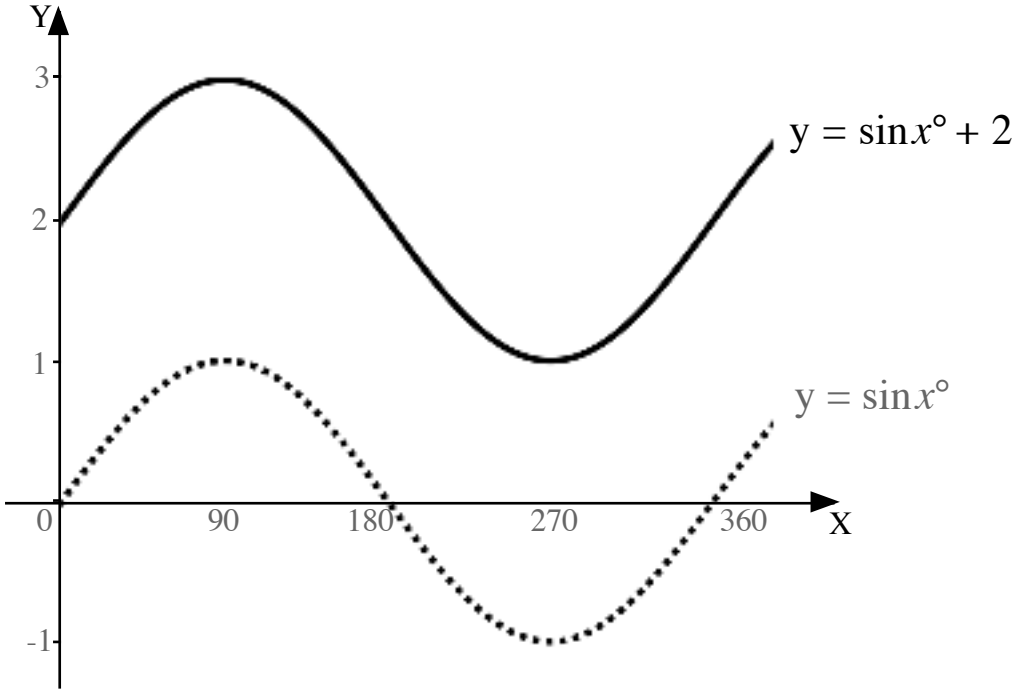
X-STRETCH $y = \sin \mathbf{n}x°$ x-coordinates divided by **n**.
period $360° \div \mathbf{n}$. There are **n** cycles in 360°.

(2)



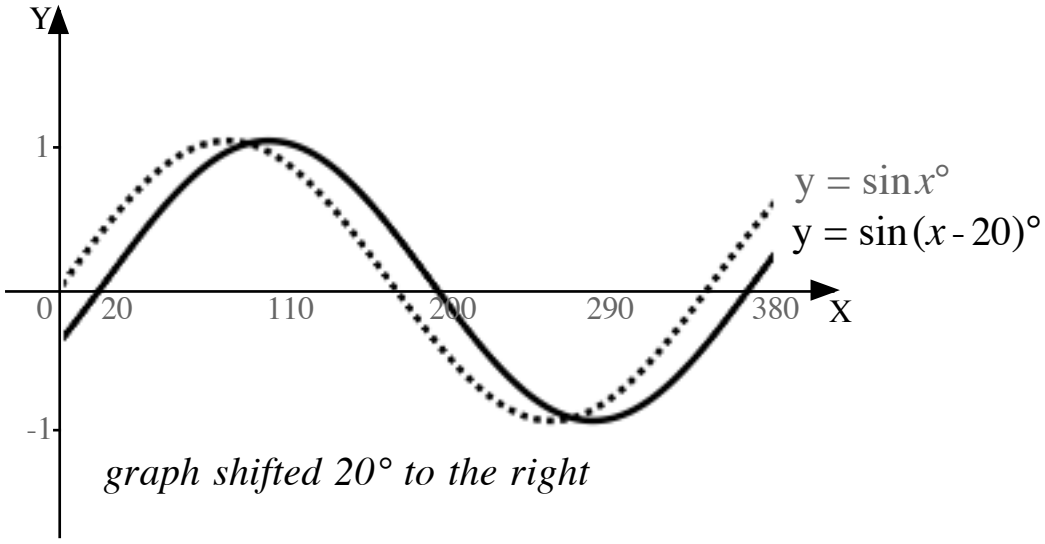
Y-SHIFT $y = \sin x° + \mathbf{n}$ add **n** units to y-coordinates
graph shifted **n** units vertically.

(3)



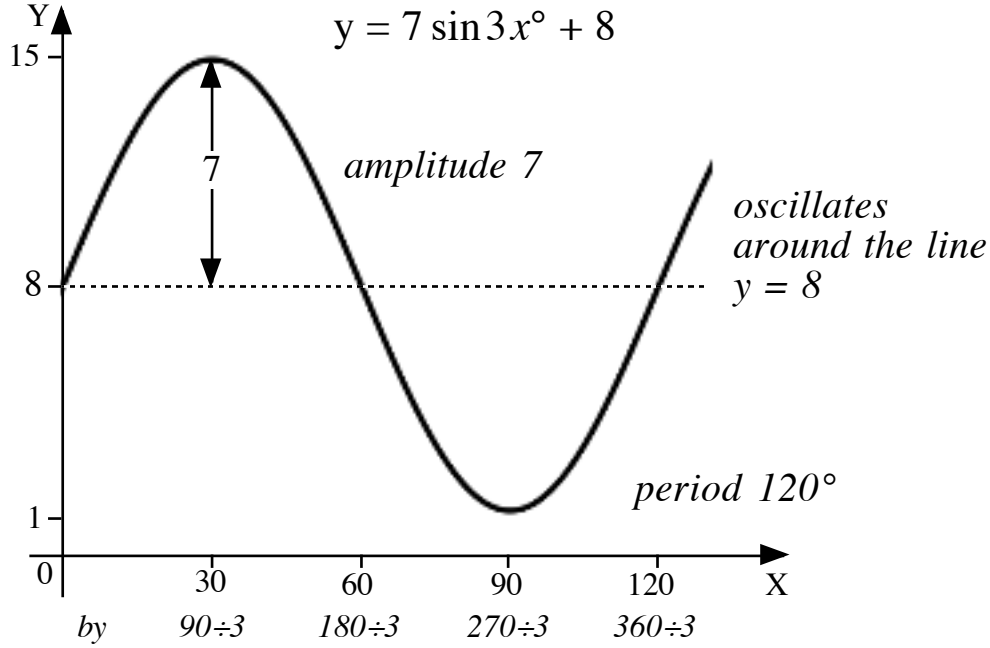
X-SHIFT $y = \sin(x + \mathbf{n})°$ subtract **n** units from the x-coordinates
graph shifted $-\mathbf{n}°$ horizontally.

(4)



NOTE: for $y = \sin(x + 20)°$ the graph $y = \sin x°$ would be shifted 20° to the left.

COMBINING TRANSFORMATIONS

(1) 

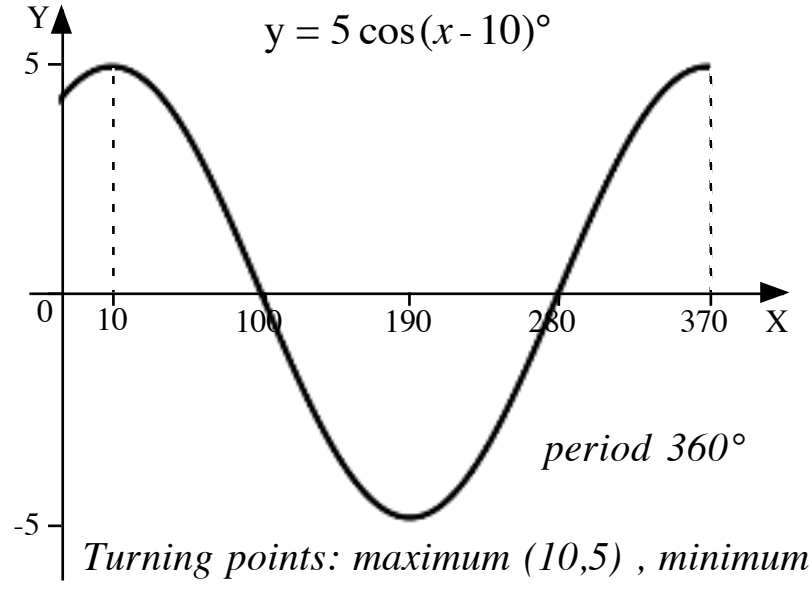
$y = 7\sin 3x° + 8$

Turning points: maximum (30,15) , minimum (90,1)

$y = \sin x°$ $\quad (90\ ,\ 1)$ $\quad (270\ ,\ -1)$

$\div 3 \downarrow \quad \times 7 + 8 \downarrow$ $\quad \div 3 \downarrow \quad \times 7 + 8 \downarrow$

$y = 7\sin 3x° + 8$ $\quad (30\ ,15)$ $\quad (90\ ,\ 1)$

(2) 

$y = 5\cos(x - 10)°$

Turning points: maximum (10,5) , minimum (190,-5)

$y = \cos x°$ $\quad (0\ ,\ 1)$ $\quad (180\ ,\ -1)$

$+10 \downarrow \quad \times 5 \downarrow$ $\quad +10 \downarrow \quad \times 5 \downarrow$

$y = 5\cos(x-10)°$ $\quad (10\ ,\ 5)$ $\quad (190\ ,-5)$