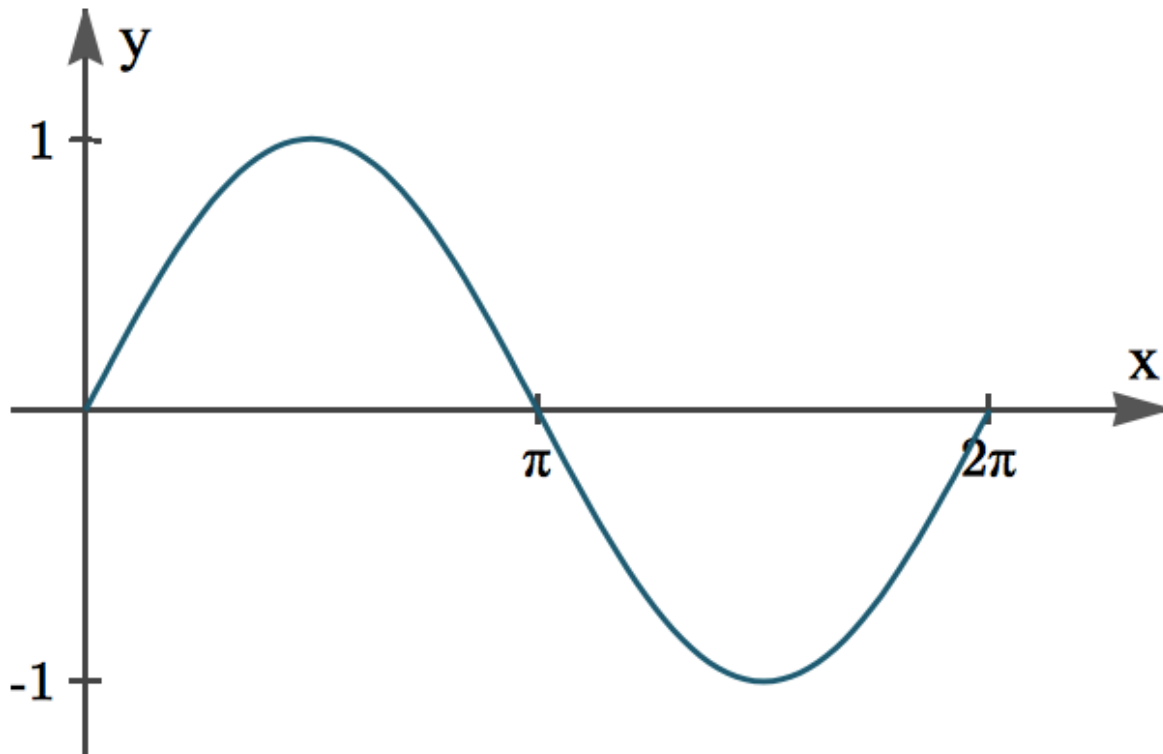
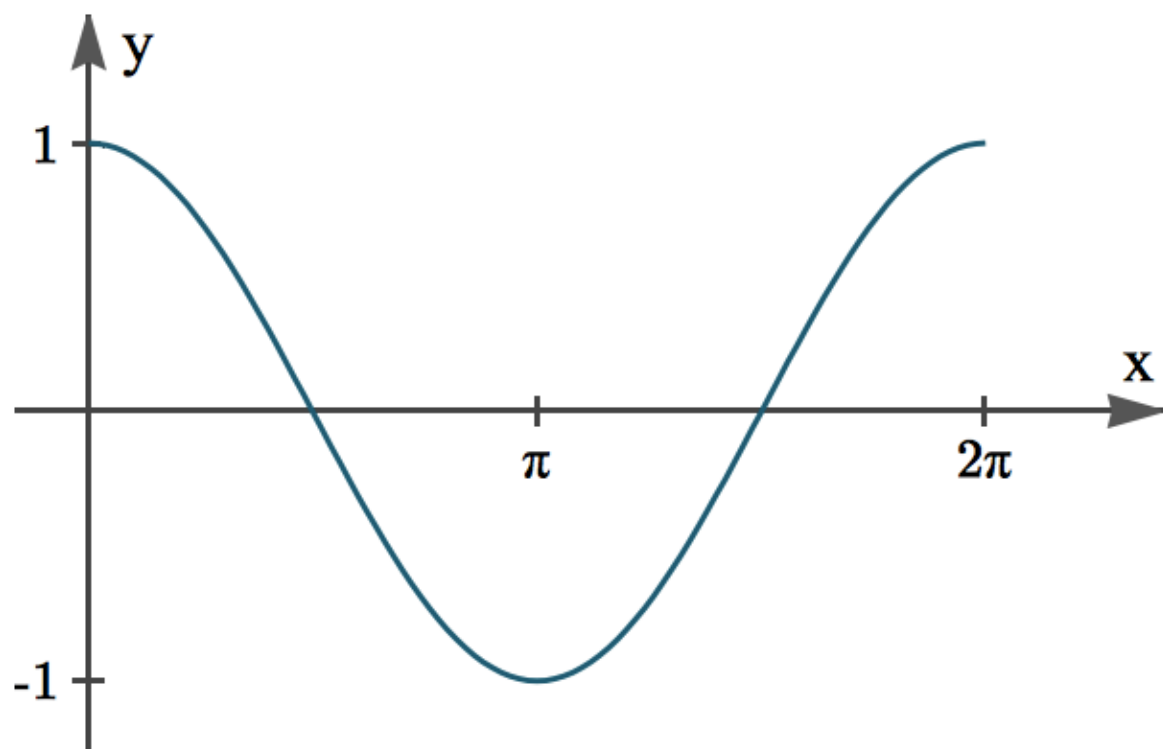


Trigonometric transformation

Sine graph



Cosine graph



Transformation

$$A f(B(x + C)) + D$$

A: Affects amplitude

B: Affects period

C: Affects horizontal translation

D: Affects vertical translation

The **period** for sine and cosine function is 2π .

Amplitude is half of the vertical distance.

A

A f(x)

A is amplitude.

A multiplies the y-coordinates.

$$A = \frac{y_{max} - y_{min}}{2}$$

1. Sketch the graph of the followings.

(a) $y = 2 \sin x$

(b) $y = 0.5 \sin x$

B

f(Bx)

B affects the period.

$$\text{New period} = \frac{2\pi}{B}$$

1. Sketch the graph of the followings.

(a) $\sin 2x$

(b) $\sin \frac{3}{2}x$

C

$f(x + C)$

C is the horizontal shift.

If C is **Positive**, shift **Left**

e.g. $f(x + 2)$ means shift Left by 2.

If C is **Negative**, shift **Right**

e.g. $f(x - 1)$ means shift Right by 1.

1. Sketch the graph of the followings.

(a) $\sin(x + 50^\circ)$

(b) $\sin(x - \pi)$

D

$f(x) + D$

D is the vertical shift.

If **D** is Positive, shift **Up**

e.g. $f(x) + 1$ means shift Up by 1.

It **D** is Negative, shift **Down**

e.g. $f(x) - 3$ means shift Down by 3.

1. Sketch the graph of the followings.

(a) $\sin x + 2$


(b) $\sin x - 1$

(c) $\cos x + 3$

(d) $\cos x - 2$

Exercise

Paper 1

1.  $f(x) = \cos 2x$ and $g(x) = 2x^2 - 1$.

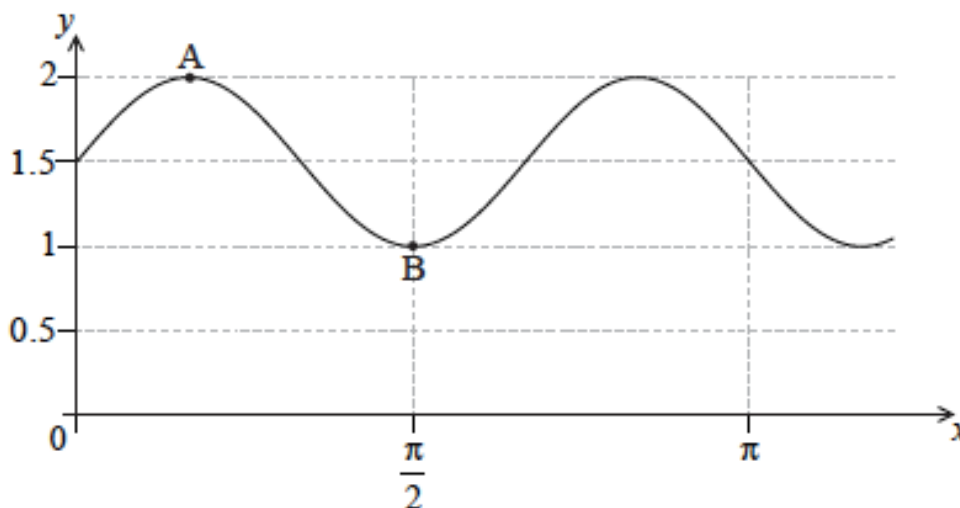
(a) Find $f\left(\frac{\pi}{2}\right)$.

(b) Find $(g \circ f)\left(\frac{\pi}{2}\right)$.

(c) Given that $(g \circ f)(x)$ can be written a $\cos(kx)$, find the value of k , $k \in \mathbb{Z}$.

Paper 2

1.  The following diagram shows part of the graph of $y=p \sin(qx)+r$.



The point $A\left(\frac{\pi}{6}, 2\right)$ is a maximum point and the point $B\left(\frac{\pi}{2}, 1\right)$ is a minimum point.

Find the value of

- (a) p
- (b) r
- (c) q
