

Recall: $y = af(b(x - c)) + d$ is the image of $y = f(x)$ after these transformations:

a = vertical expansion/compression (amplitude change)

b = horizontal expansion/compression (period change)

c = horizontal translation (phase shift)

d = vertical translation (the centre line)

1. Identify the amplitude, centre line, max, min, period and phase shift for each function, then sketch the graph for $-2\pi \leq x \leq 2\pi$.

a) $y = 4 \sin 2x - 1$

Amplitude: 4

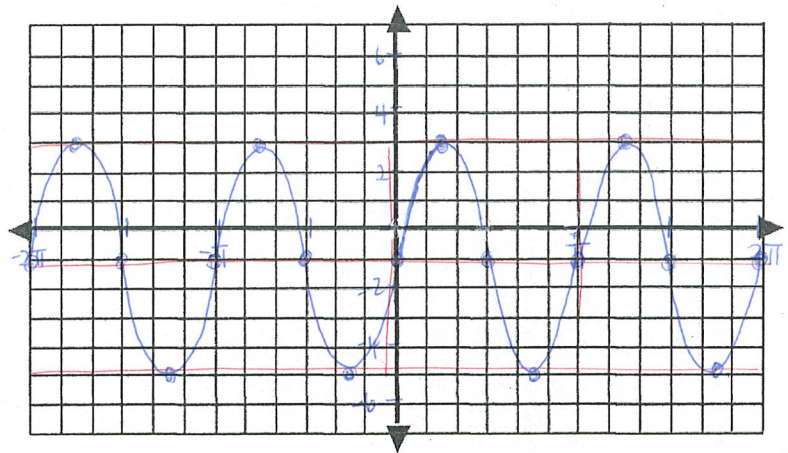
Centre line: -1

Maximum: 3

Minimum: -5

Period: $\frac{2\pi}{2} = \pi$

Phase Shift: \emptyset



each line = $\frac{\pi}{6}$

b) $y = \frac{1}{4} \cos 3\left(x - \frac{\pi}{6}\right)$

Amplitude: $\frac{1}{4}$

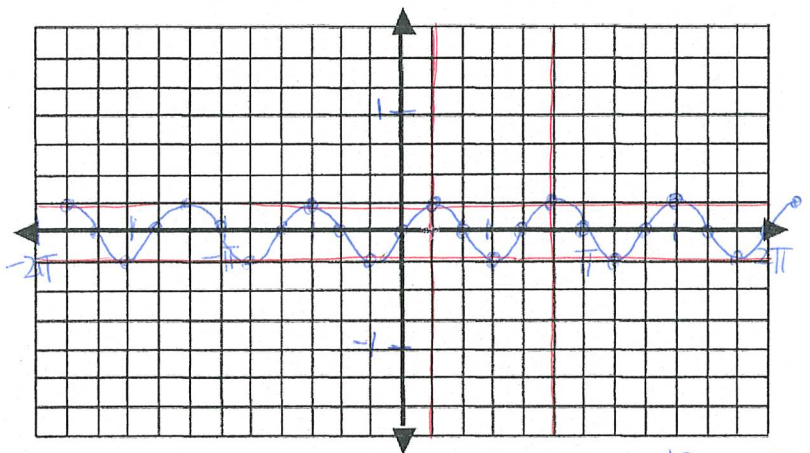
Centre line: 0

Maximum: $\frac{1}{4}$

Minimum: $-\frac{1}{4}$

Period: $\frac{2\pi}{3}$

Phase Shift: $\frac{\pi}{6}$ (right)



each line = $\frac{\pi}{6}$

* upside down!

c) $y = -\sin\left(\frac{1}{2}x + \frac{\pi}{6}\right) + 2 = -\sin\frac{1}{2}\left(x + \frac{\pi}{3}\right) + 2$

Amplitude: 1

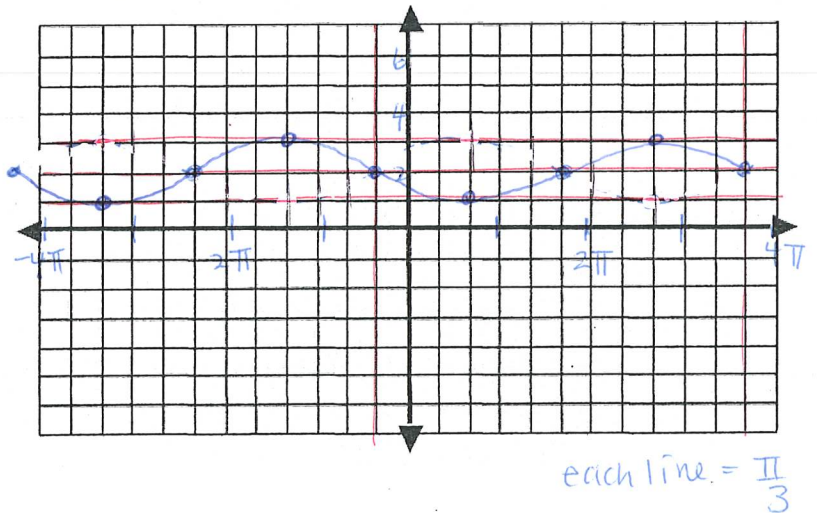
Centre line: 2

Maximum: 3

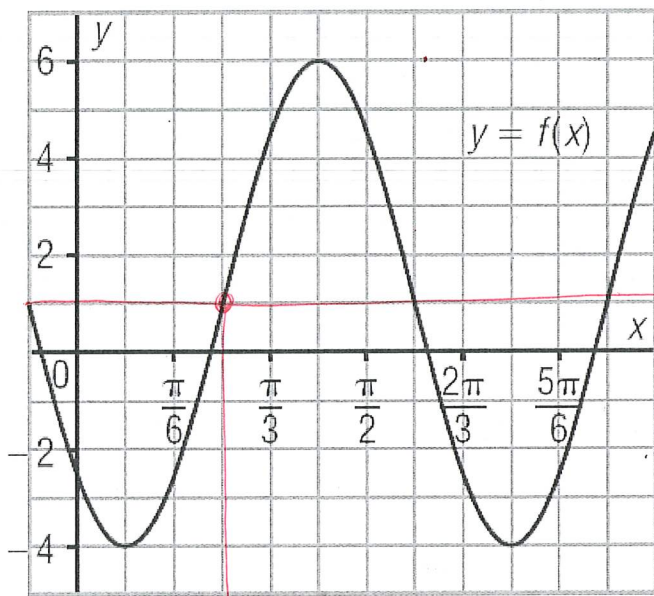
Minimum: 1

Period: $\frac{2\pi}{\frac{1}{2}} = 4\pi$

Phase Shift: $-\frac{\pi}{3}$ (left)



Ex. 2 Write an equation for the sinusoidal function below in terms of $\sin x$.



amplitude = 5

→ centre line = 1

* each line = $\frac{\pi}{12}$

phase shift = $\frac{3\pi}{12} = \frac{\pi}{4}$

period = $\frac{8\pi}{12} = \frac{2\pi}{3}$

⇒ $b = 3$

$$y = 5\sin 3\left(x - \frac{\pi}{4}\right) + 1$$