

5.8B – Transforming the Trigonometric Functions

Example 1: Sketch 1 complete cycle for each of the following

Factor out the 2 in front of variable.

a) $y = 2 \sin\left(\frac{1}{2}x\right) - 1$

b) $g(x) = -3 \cos(2\theta - \pi) + 1$

c) $y = \sin(\pi x)$

$g(x) = -3 \cos\left(2\left(\theta - \frac{\pi}{2}\right)\right) + 1$

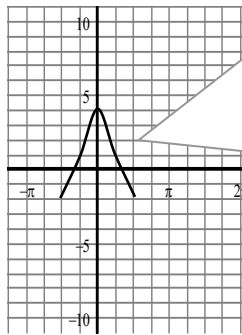
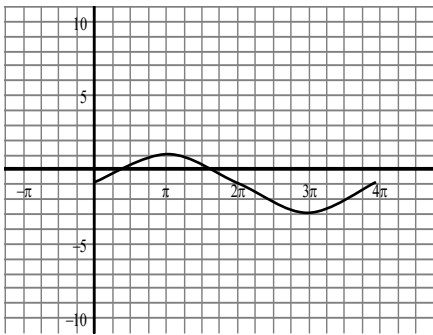
π is just a number (i.e. 3.14).

D: - 1
PS: n/a
P: $2\pi/0.5$
A: 4
A: 2

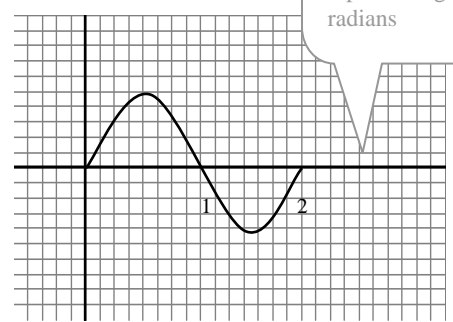
D: + 1
PS: $+\pi/2$
P: $2\pi/2$
A: π
A: 3 (reflect vertically)

D: n/a
PS: n/a
P: $2\pi/\pi$
A: 2 radians
A: 1

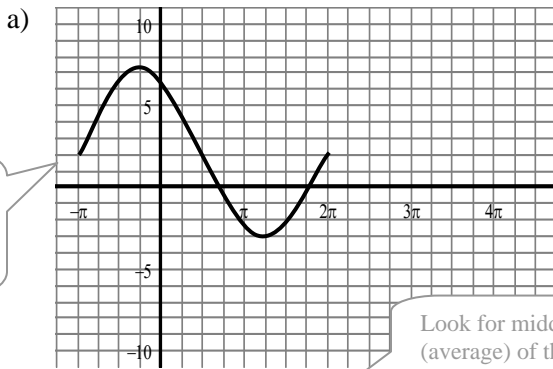
Best to re-write axis with integer numbers representing radians



Cosine is always a bit more difficult to graph because the end point is at a max or min meaning you have to count an amplitude from the displacement to get your starting point



Example 2: Determine the equation of the following using the sine function;



Graph given in radian means your equation should be written in radians

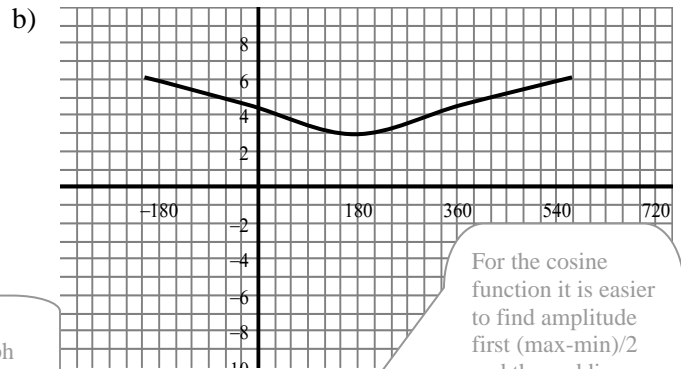
Look for middle (average) of the graph

Displacement: + 2
Phase shift: $-\pi$
Period: $k = 2\pi/3\pi$
 $k = 2/3$
Amplitude: 5

If $P = 2\pi/k$
Then $k = P/2\pi$

Pick end of function point and count how much over it moved

$\therefore f(x) = 2 \sin(2/3(x + \pi)) + 5$



For the cosine function it is easier to find amplitude first (max-min)/2 and then adding the amplitude to the minimum to find the displacement.

Displacement: + 4.5
Phase shift: -210°
Period: $^\circ 780/360^\circ$
 $13/6$
Amplitude: 1.5

$A = (6-3)/2 = 1.5$
 $D = 3 + 1.5 = 4.5$

$\therefore f(x) = 1.5 \cos(2.17(\theta + 210^\circ)) + 4.5$

5.8B – Transforming the Trigonometric Functions Practice Questions

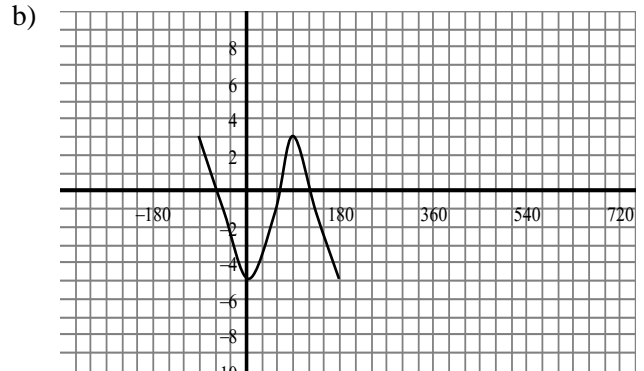
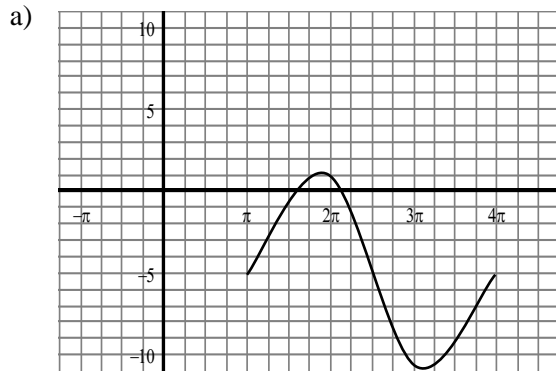
1. Sketch 1 complete cycle for each of the following.

- | | | |
|--|--------------------------------------|---------------------------------|
| a) $y = -\sin 2x - 2$ | b) $y = 30\cos(2x - 90^\circ)$ | c) $g(x) = 3\sin \pi x$ |
| d) $g(x) = \sec(x - 60^\circ) + 3$ | e) $h(x) = \cos 2(x + \pi)$ | f) $f(x) = \tan -x$ |
| g) $y = 2\sin \frac{1}{2}(x + \pi/3) + 1$ | h) $g(x) = 4\cos(-x - 30^\circ) - 2$ | i) $y = -\tan x$ |
| j) $m(x) = 2\sin x \cos x - 3$ | k) $y = 2\csc(2x + \pi/4)$ | l) $h(x) = \tan(x - \pi/2) - 1$ |
| m) make up 3 of your own sine or cosine functions to graph | | |

2. Determine the equation of the following using most appropriate function.

- Sine function with displacement of -3 and period of 90° .
- Cosine function with period of 6π and amplitude of 20.
- Tangent function with zero at 30° and period of 360° .
- Sine function with period of $3\pi/2$, phase shift of $3\pi/2$, and a displacement of +5.

3. Determine the equation of the following function.



4. On a certain day the depth of water off a pier at high tide was 6m. After 6 hours, the depth of the water was 3m. Assuming a 12 hour cycle find a co-sinusoidal function to model the height of the tide as a function of time, t hours since high tide. Use your equation to determine the height of the tide, to nearest tenth of a meter, 2 days and 5 hours since the first high tide.

Answers 1. a) check graphs on calculator (note that you will need to adjust window for degree sketches. For radian sketches you will need to set to radian mode and can use z-trig zoom to adjust scale by π count)
 2. a) $y = \sin 4x - 3$ b) $y = 20\cos(x/3)$ c) $y = \tan[\frac{1}{2}(x - 30)]$ or $y = \tan(x/2 - 15)$ d) $y = \sin[4/3(x - 3\pi/2)] + 5$ or $y = \sin(4/3x - 2\pi) + 5$ 3. a) $y = 6\sin[2/3(x - \pi)] - 5$ b) $y = 4\cos[2(x + 90)] - 1$ or $y = 4\cos(2x + 180) - 1$
 4. a) $h(t) = 1.5\cos(30t) + 4.5$, $h(53) = 3.2\text{m}$

5.8B – Transforming the Trigonometric Functions Practice Sheets

