FINDING EQUATIONS OF CIRCULAR FUNCTIONS

WORKSHEET 1

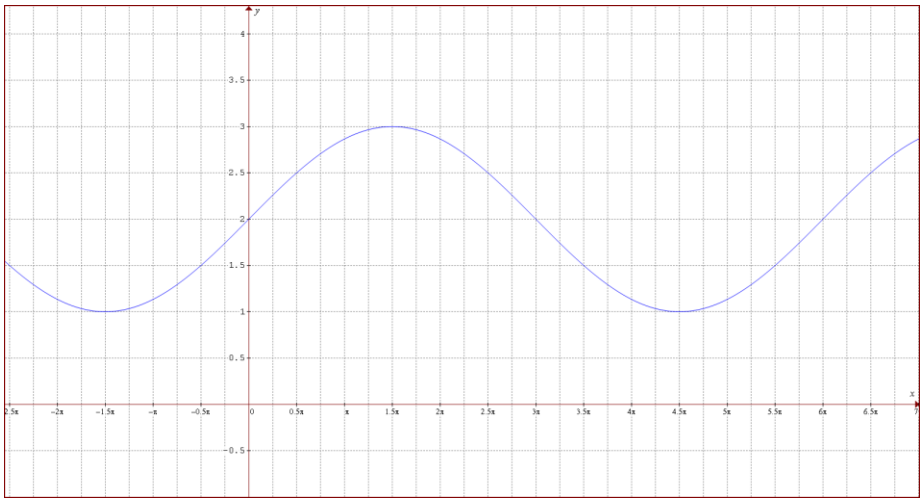
QUESTION 1
Write an equation for a trigonometric function with the specified characteristics.

	Function	**Amplitude**	**Period**	**Reflection**	**Horizontal Translation**	**Vertical Translation**
(a)	Cosine	0.6	4π	In X axis	None	None
(b)	Sine	5	$\frac{2\pi}{3}$	In Y axis	None	Up 2
(c)	Cosine	15	4π	None	Left $\frac{\pi}{2}$	Down 10
(d)	Sine	$\frac{2}{5}$	$\frac{\pi}{3}$	In both axes	Right $\frac{\pi}{3}$	None

Solution

QUESTION 2

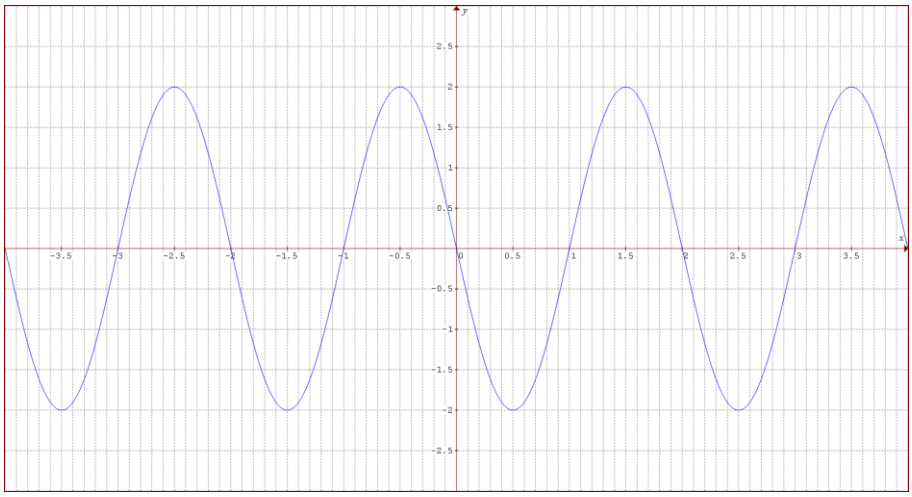
If the graph of the function shown below has the equation $y = a\sin bx + d$, find the values of a, b and d .



Solution

QUESTION 3

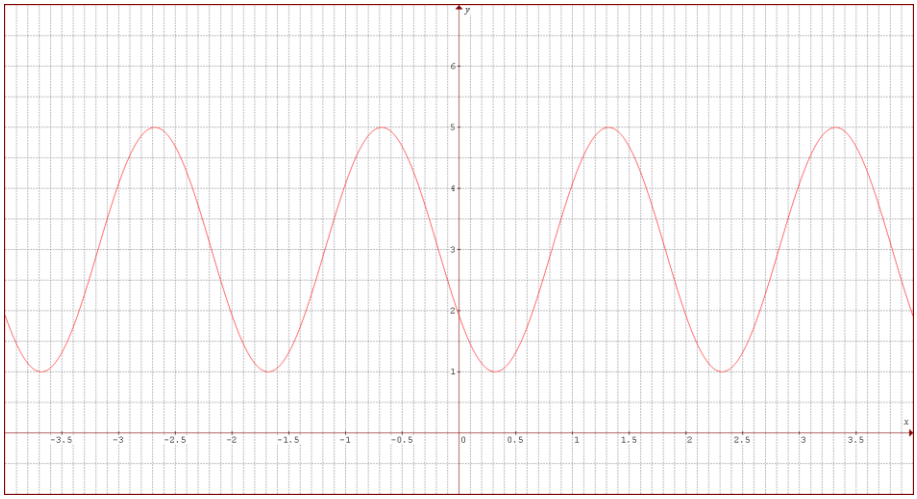
If the graph of the function shown below has the equation $y = a\sin bx + d$, find the values of a, b and d .



Solution

QUESTION 4

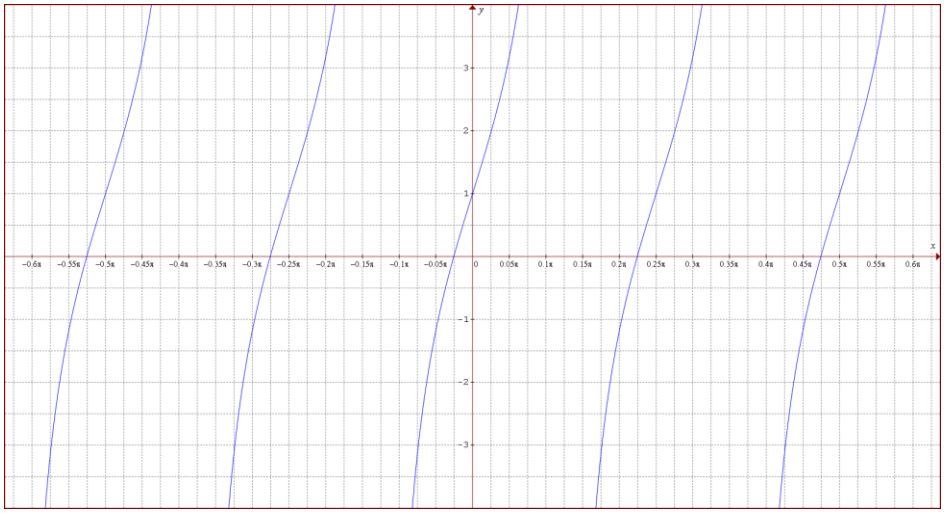
Find $f(x)$ given that $f(x)$ is in the form $a\cos(bx+c)+d$.



Solution

QUESTION 5

The equation describing the given graph is $y = a\cos(bx + c) + d$. Find a, b, c and d and hence state the equation.



Solution

QUESTION 6
The average monthly minimum temperatures for a small town are shown below.

Month (x)	1	2	3	4	5	6	7	8	9	10	11	12
Temperature ^{o}F	19	27	38	45	57	62	65	58	51	41	33	25

The function that models the average monthly minimum temperatures is of the form $f(x) = a\sin\left[b(x-d)\right]+c$ where a, b, c and d are constants, and x represents the month, where $x = 1$ represents January. Find the equation $f(x)$.

Solution

QUESTION 7

A wheel with radius 20 cm has a centre 30 cm above the ground and is modelled by a cosine function. It rotates once every 15 seconds. Determine an equation for the height, h, above the ground of a point on the wheel at time t seconds if this point has a maximum at $t = 2$ seconds.

Solution

QUESTION 8

The pedals on a bicycle have a maximum height of 30 cm above the ground and minimum distance of 8 cm above the ground. A person pedals at a constant rate of 20 cycles per minute. Determine an equation for this cosine function, given that t is in seconds.

Solution

QUESTION 9

Tides are a periodic rise and fall of water in the ocean. A low tide of 4.2 metres in Vancouver occurs at 4:30am, The next high tide of 11.8 metres occurs at 11:30am on the same day. If the tide is modelled by a cosine function, find an equation to describe the tide given that t is in hours.

Solution

ANSWERS

QUESTION 1

(a) $y = -0.6\cos\left(\frac{\pi}{2}\right)$

(b) $y = 2 + 5\sin(-3x)$

(c) $y = 15\cos\frac{\pi}{2}\left(x + \frac{\pi}{2}\right) - 10$

(d) $y = -\frac{2}{5}\sin 6\left(\frac{\pi}{3} - x\right)$

QUESTION 2 $y = \sin\left(\frac{x}{3}\right) + 2$

QUESTION 3 $y = -2\sin(\pi x)$

QUESTION 4 $y = 3 - 2\cos(\pi x - 1)$

QUESTION 5 $y = 3\tan(4x + \pi) + 1$

QUESTION 6 $f(x) = 23\sin\left[\left(\frac{\pi}{6}(x-4)\right)\right] + 42$

QUESTION 7 $h = 20\cos\frac{2\pi}{15}(t-2) + 30$

QUESTION 8 $y = 11\cos\left(\frac{2\pi}{3}x\right) + 19$ or $y = -11\cos\left(\frac{2\pi}{3}x\right) + 19$

QUESTION 9 $h(t) = -3.8\cos\frac{\pi}{7}(t - 4.5) + 8$