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OUTCOME T4 – Review

1. For each of the following trigonometric functions, state the **amplitude**, **period**, and **range**.

a) $y = -2\cos\left(3\left(x + \frac{\pi}{6}\right)\right) - 7$

Amplitude: 2

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

Range: $[-9, -5]$

b) $y = \cos(2x - \pi) + 5$

Amplitude: 1

Period: π

Range: $[4, 6]$

c) $y = 4\sin\left(\frac{1}{2}\left(x + \frac{\pi}{2}\right)\right) + 1$

Amplitude: 4

Period: 4π

Range: $[-3, 5]$

d) $y = -\sin\left(2\left(x - \frac{\pi}{4}\right)\right)$

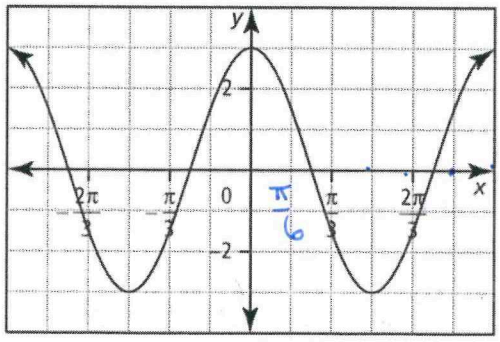
Amplitude: 1

Period: π

Range: $[-1, 1]$

2. For each graph, determine the **amplitude**, **period**, and the **equation of the central axis**.

a)

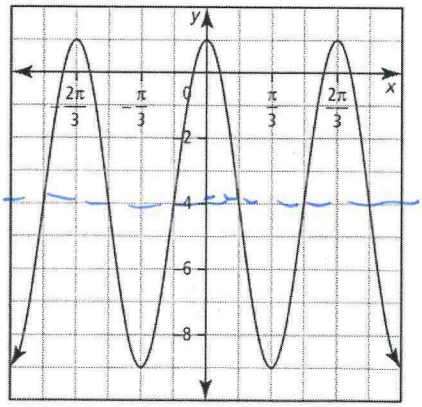


Amplitude: 3

Period: π

Central Axis: $y = 0$

b)



Amplitude: 4

Period: $2\pi/3$

Central Axis: $y = -4$

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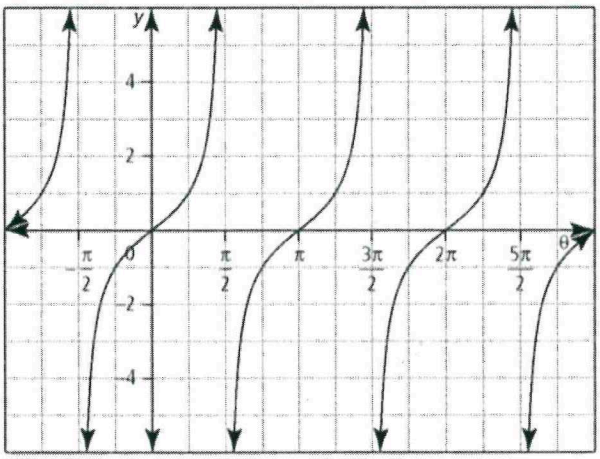
3. Use the graph of the function $y = \tan\theta$ to determine each value.



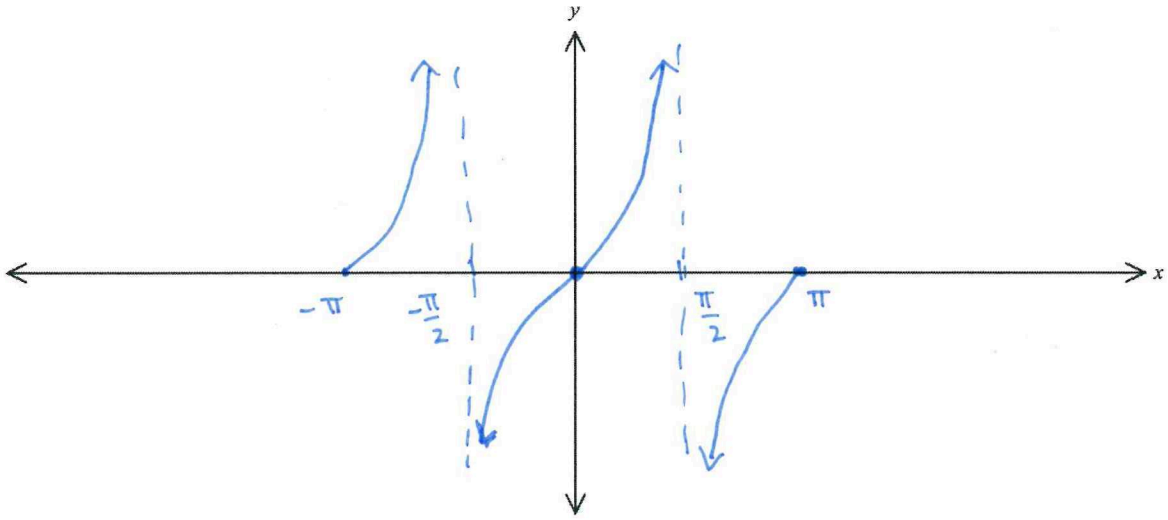
a) $\tan\pi =$ 0

b) $\tan\left(-\frac{\pi}{4}\right) =$ -1

c) $\tan\left(\frac{9\pi}{4}\right) =$ 1

d) $\tan\left(\frac{5\pi}{2}\right) =$ undefined

4. a) Graph $y = \tan x$ over the interval $-\pi \leq x \leq \pi$.



b) State the coordinates of the x- intercepts.

over the reals $x = \pi n \quad n \in Z$

on the interval $-\pi \leq x \leq \pi$ $(-\pi, 0), (0,0), (\pi, 0)$

c) Determine the y – intercept.

0

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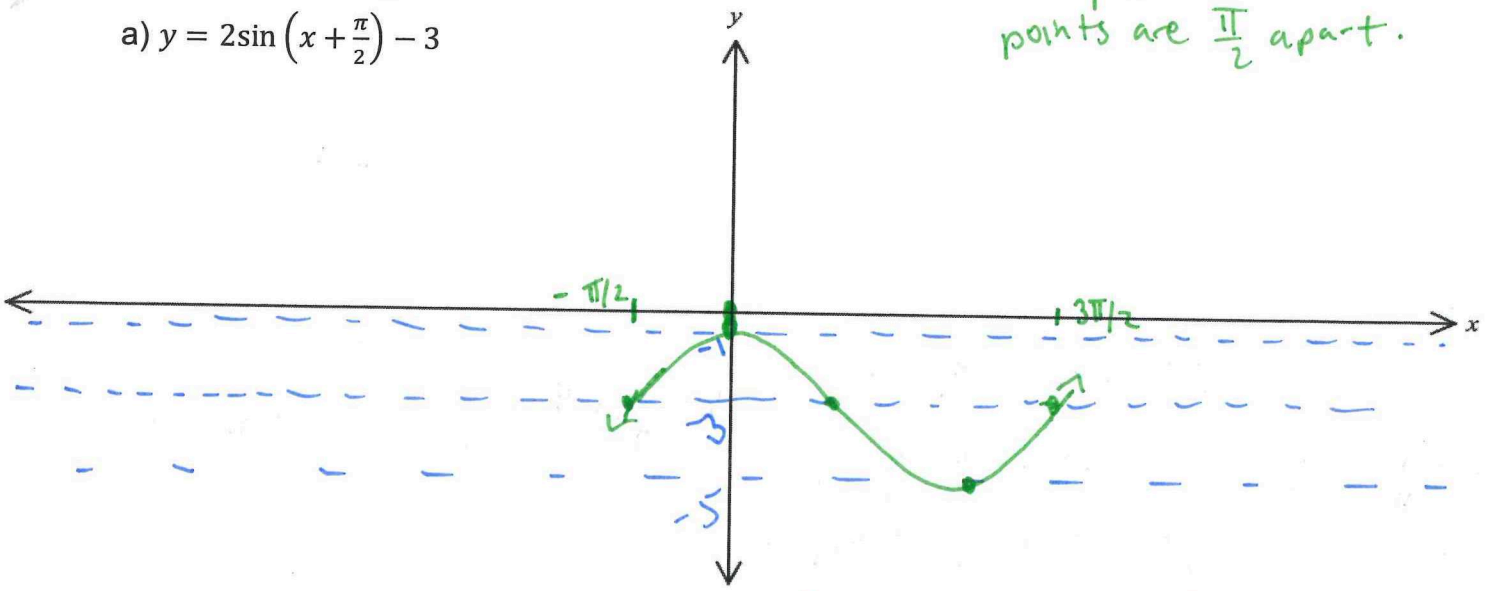
5. Graph each of the following trigonometric functions.

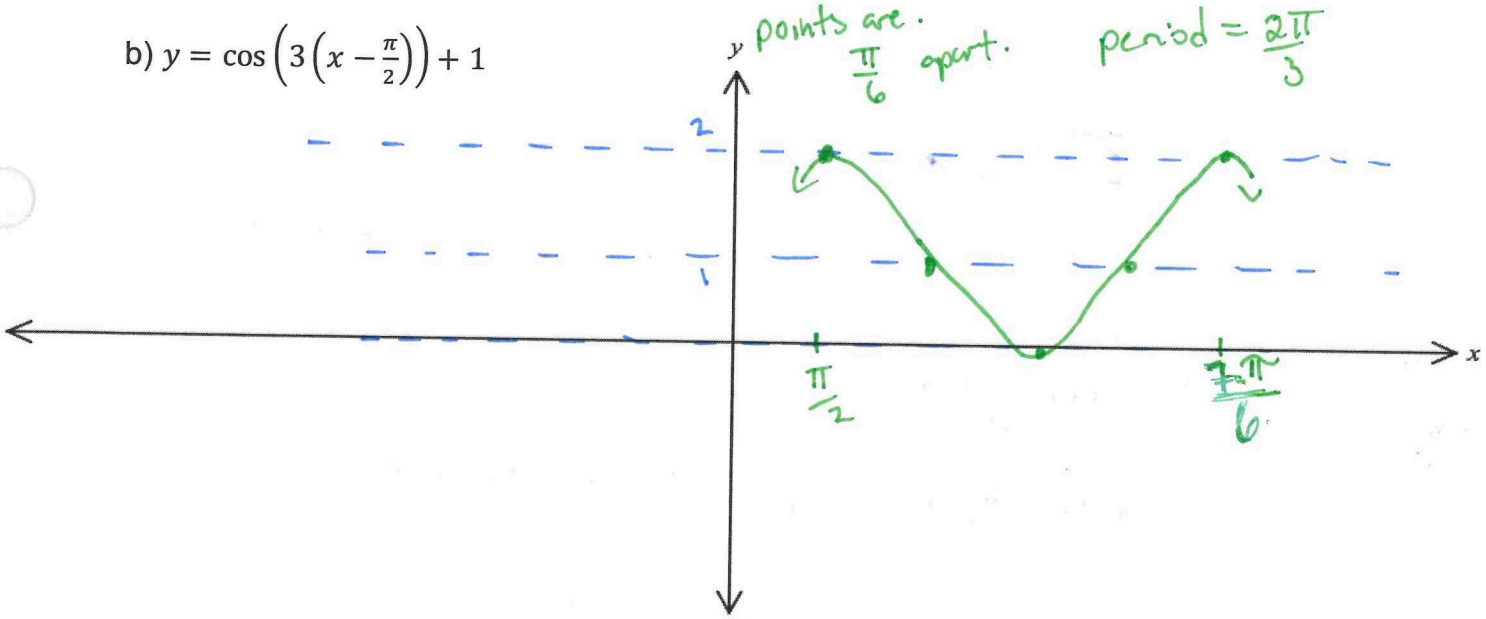
a) $y = 2\sin\left(x + \frac{\pi}{2}\right) - 3$

period $= 2\pi$
points are $\frac{\pi}{2}$ apart.



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

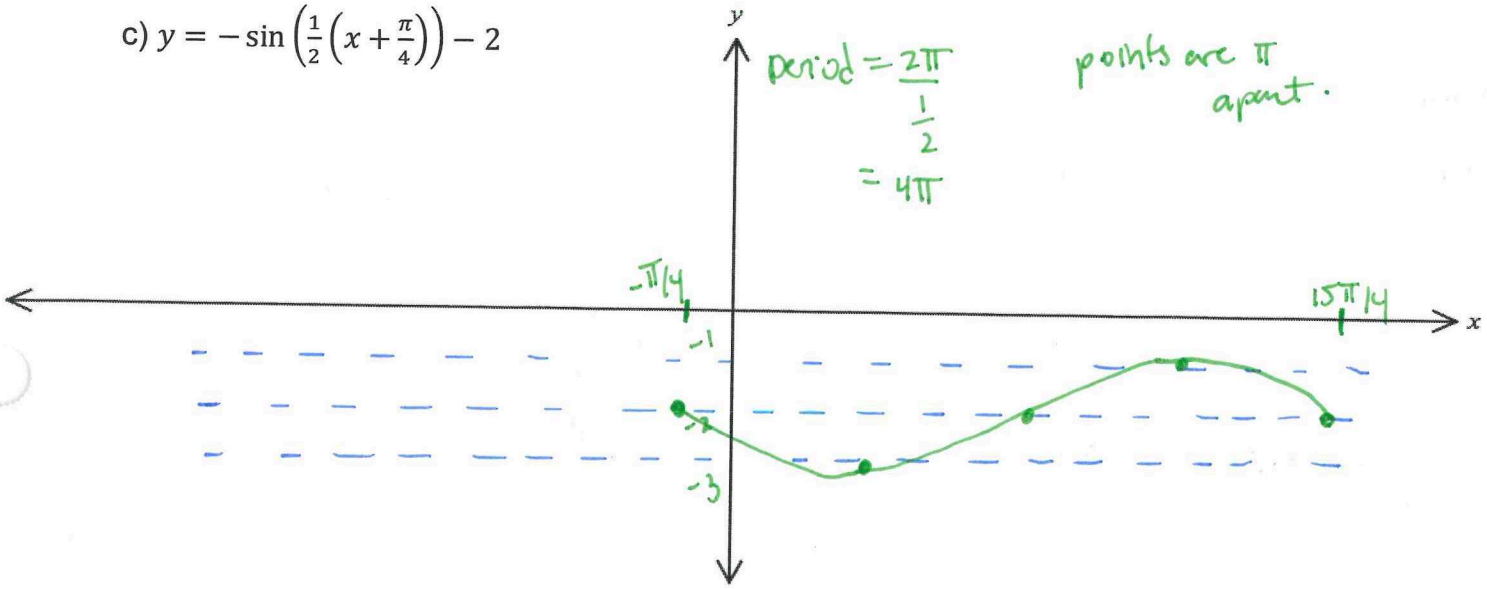
points are $\frac{\pi}{6}$ apart.
period $= \frac{2\pi}{3}$



c) $y = -\sin\left(\frac{1}{2}\left(x + \frac{\pi}{4}\right)\right) - 2$

period $= \frac{2\pi}{\frac{1}{2}} = 4\pi$

points are π apart.



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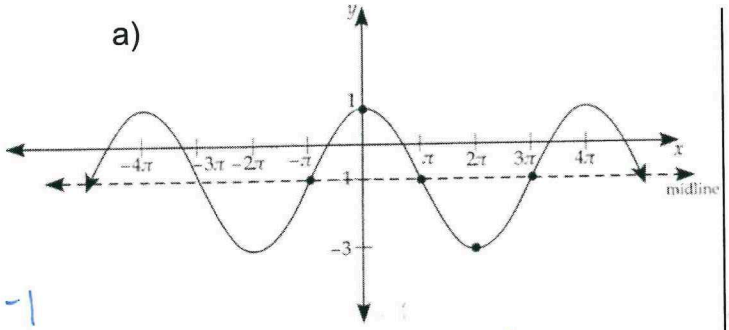
* your equations may have different "c" values!

6. Write the **equation** of the following graphs using both the sine and cosine function.

a)



d = -1

a = 2

$b = \frac{2\pi}{4\pi} = \frac{1}{2}$

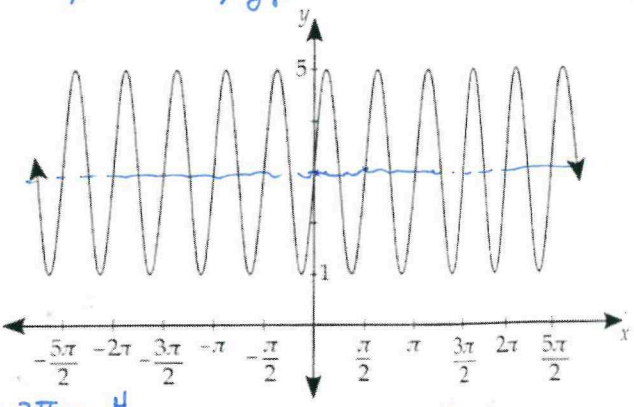
c = 0

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

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

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

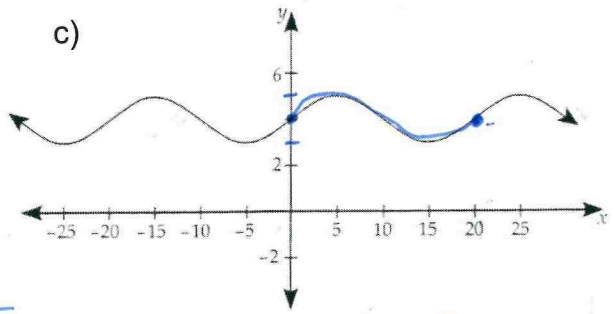
b)



$b = \frac{2\pi}{\frac{\pi}{2}} = 4$

$y = 2\sin(4x) + 3$

c)

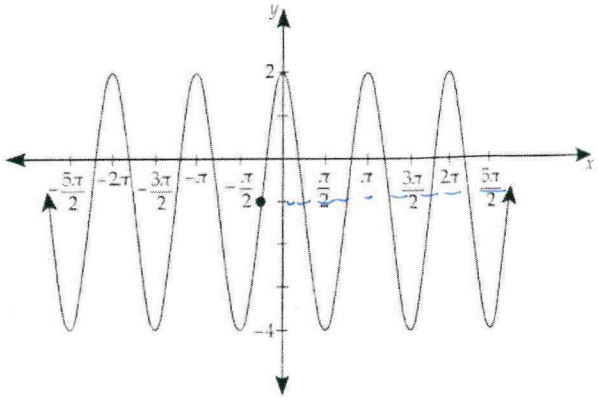


$b = \frac{2\pi}{20} = \frac{\pi}{10}$

$y = 2\sin\left(\frac{\pi}{10}x\right) + 4$

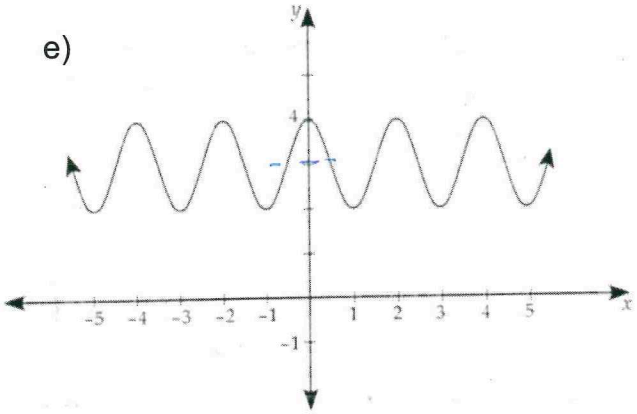
$y = 2\cos\left(\left(\frac{\pi}{10}(x-5)\right) + 4\right)$

d)



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

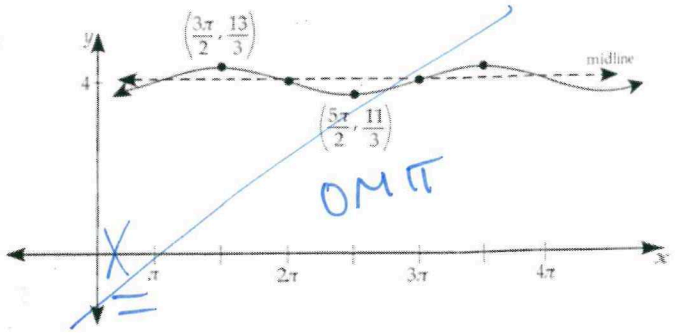
e)



$b = \frac{2\pi}{2} = \pi$

$y = \cos(\pi x) + 3$

f)



$y = \frac{1}{3}$

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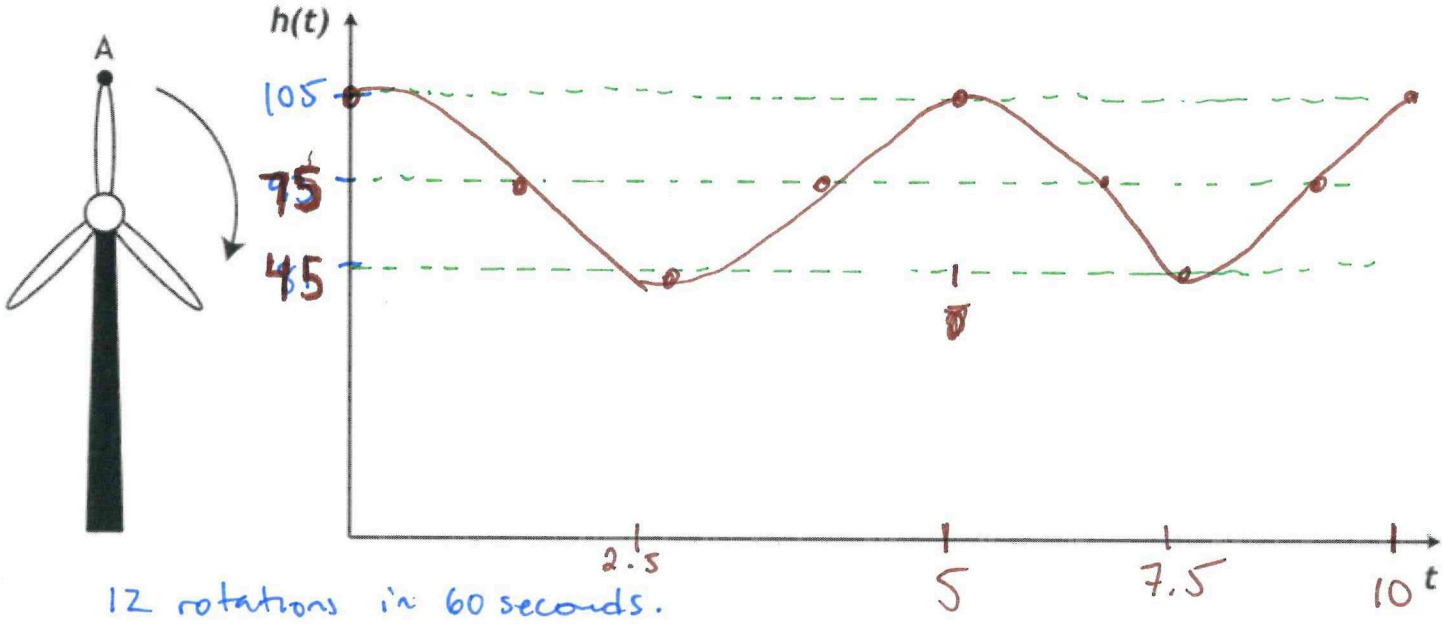
7. A wind turbine has blades that are 30 radios metres long. An observer notes that one blade makes 12 complete rotations (clockwise) every minute. The highest point of the blade during the rotation is 105 metres.

a) Using point A as the starting point of the graph, **draw** the height of the blade over two rotations.



12 rotations in 60 seconds.

1 rotation in 5 seconds.

$b = \frac{2\pi}{\text{period}} = \frac{2\pi}{5}$

b) Write a **function** that corresponds to the graph.

$h(t) = 30\cos\left(\frac{2\pi}{5}t\right) + 75$

c) Do we get a different graph if the wind turbine rotates counter clockwise?

No, The graph still begins at the max and proceeds down!

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8. The average daily maximum temperature in Edmonton follows a sinusoidal pattern over the course of one year (365 days). Edmonton's highest temperature occurs on the 201st day of the year (July 20th) with an average high of $24°C$. Its coldest average temperature is $-16°C$, occurring on January 14th.

a) Write a cosine equation for Edmonton's temperature over the course of the year.

b) What is the expected average temperature for August 4th?

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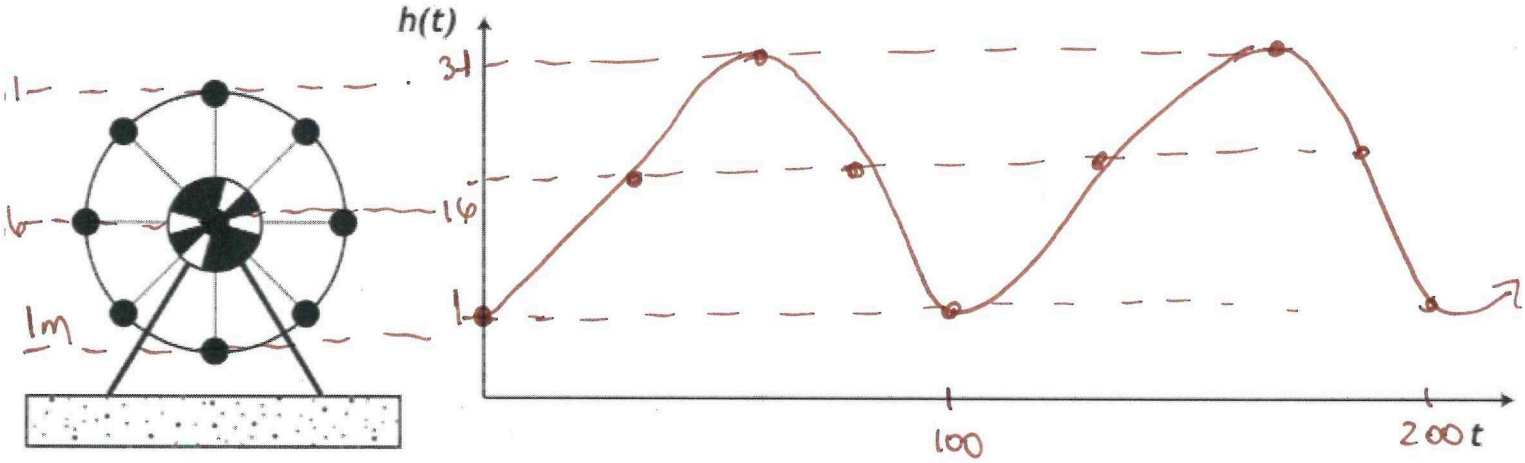
9. A Ferris wheel with a radius of 15 metres rotates once every 100 seconds. Riders board the Ferris wheel using a platform 1 metre above the ground.

a) Draw the graph for two full rotations of the Ferris wheel.



$$b = \frac{2\pi}{\text{period}} = \frac{2\pi}{100} = \frac{\pi}{50}$$

b) Write the function that gives the height of the riders as a function of time.

$$h(t) = -15\cos\left(\frac{\pi}{50}t\right) + 16$$

c) Calculate the height of the rider after 1.6 rotations of the Ferris wheel. Round your final answer to 3 decimal places.

↓ 160 seconds

$$h(160) = -15\cos\left(\frac{\pi}{50}(160)\right) + 16$$

$$= 28.135 \text{ m.}$$