Pre-Calculus 12A

Unit Test: Sinusoidal Relations **Name:_____**

Show all your work for each of the following in the space that is provided.

1. Complete the chart and sketch **one** full cycle for the functions in the space provided below. Be sure to **clearly label** and scale both axes on your graphs. [26]

(a) $y = 3\sin[4(\theta + 30°)] + 1$

(b) $-3(y+2) = 12\cos\left(3\theta - \frac{\pi}{2}\right) - 3$

DOMAIN	
RANGE	
AMPLITUDE	
PERIOD	
PHASE SHIFT	
VERTICAL TRANSLATION	
EQUATION OF SINUSOIDAL AXIS	
MAPPING NOTATION	

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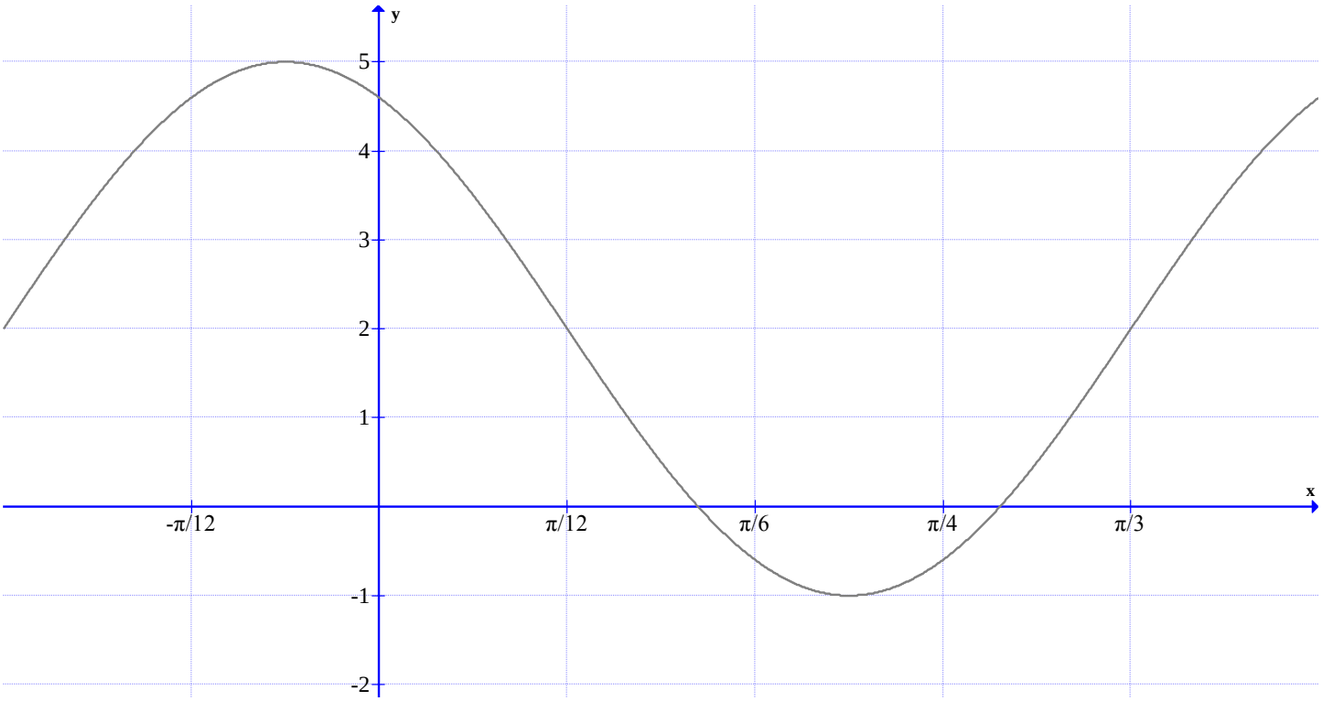
Sketch for (a)

Sketch for (b)

2. Write both a **sine** and a **cosine** function that would describe the graph shown below. [6]



3. The air quality index, I, in a large city can be modelled by the function $I = 32\sin[15(t-5)]+33$, where t represents the time, in hours, after midnight.

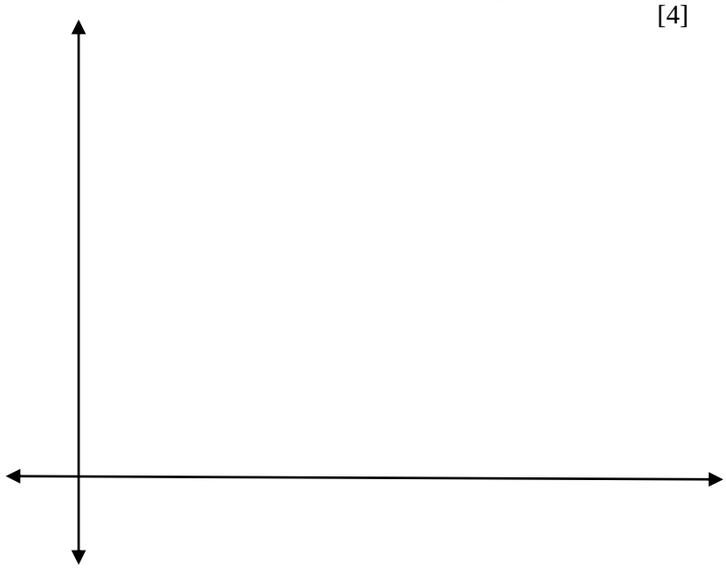
(a) What are the current minimum and maximum values of the air quality index in this city? [2]

(b) Determine the air quality index at 9:45 AM in this city. [2]

(c) What are two times during a day when the air quality index reached 48?
(Answers must be correct to the nearest minute) [6]

4. Tyson is pedaling his new mountain bike around his yard when his older brother decides to review his trigonometry skills for his upcoming test. His brother asks Tyson to pedal across the yard at a constant rate so that he can collect some data. The following information is recorded: 1.2 s after beginning a stopwatch, Tyson's right pedal is located at its highest point, 68 cm above the ground, and when the stopwatch reads 2.5 s his right pedal reaches its lowest point, 24 cm above the ground.

(a) Draw a sketch that depicts the height above the ground of the right pedal at any time after the stopwatch has been started! [4]

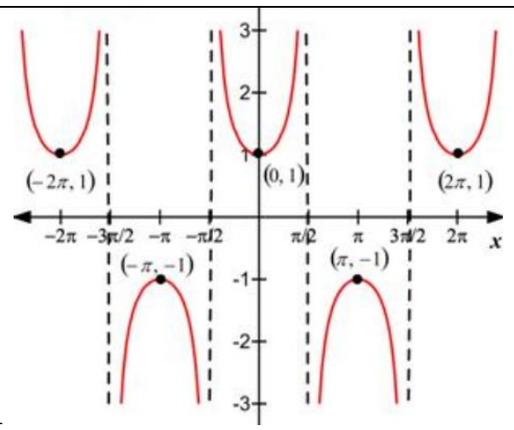
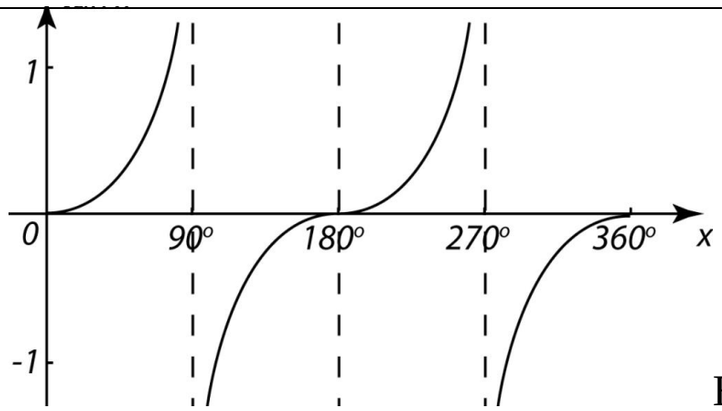
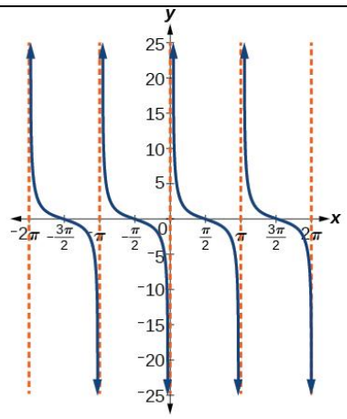


(b) Determine a function *h(t)* that would model the height above the ground in centimetres of the right pedal of Tyson's bike at any time in seconds. [4]

(c) Determine how high above the ground the right pedal would be 3 minutes and 24 seconds if he continued to pedal at a constant rate. [2]

(d) Provide the **first three** times after the stopwatch had been started that Tyson's right pedal would have been situated 50.4 cm above the ground. ***(Express answers to the nearest hundredth of a second)*** [6]

5. Match each of the following trigonometric functions in the first column with the correct graph from the second column. Place the letter corresponding to the correct graph on the blank provided. [4]

$y = \sec x$ _____	A 
$y = \cot x$ _____	 B
$y = \csc x$ _____	 C
$y = \tan x$ _____	D