MHF4U – Advanced Functions
Unit 4 – Trigonometric Functions

Summative Assignment

Instructions for students:

- Show full solutions for each question.
- Ensure the questions are included with your answer so the teacher understands which question you are answering.
- Marks may be deducted if all steps are not shown.
- Communication will be marked on the entire test by using the rubric that has been provided.

Category	Out of
Knowledge and Understanding	34
Application	12
Thinking and Inquiry	10
Communication	10

	8-10	6-8	4-6	0-4
Use correct mathematical symbols, labels, units and conventions.	Uses numerous mathematical symbols, labels and conventions accurately.	Uses many correct mathematical symbols, labels and conventions.	Uses some mathematical symbols, labels and conventions.	Uses mathematical symbols, labels and conventions in a limited manner.
Provide clear explanations and justifications in reporting.	Provides explanations and justifications that are particularly clear and detailed.	Provides explanations and justifications that are clear and for a range of audiences.	Provides explanations and justifications with some clarity.	Provides explanations and justifications with limited clarity

<u>Knowledge/Understanding</u>

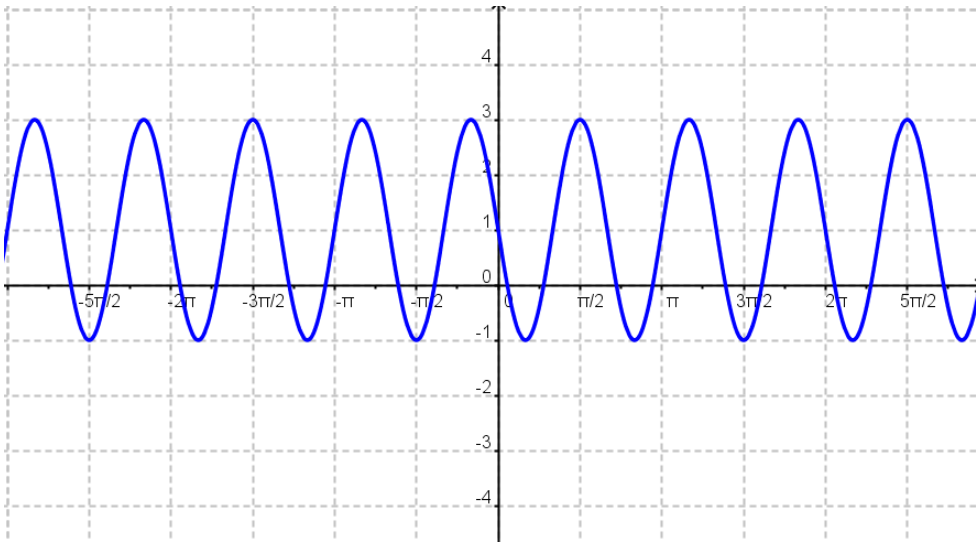
1) (1 mark) Convert -335° to radians.

2) (2 marks) Determine the exact value of $\cot\frac{7\pi}{6}$.

3) (4 marks) Explain in words the transformations that are occurring to the parent function $f(x)=\cos x$ as it is transformed into $g(x)=-2\cos\left[\frac{1}{2}\left(x-\frac{\pi}{2}\right)\right]+1$.

4) (10 marks) Given the following information about a sinusoidal function, complete each of the following tables.

a.

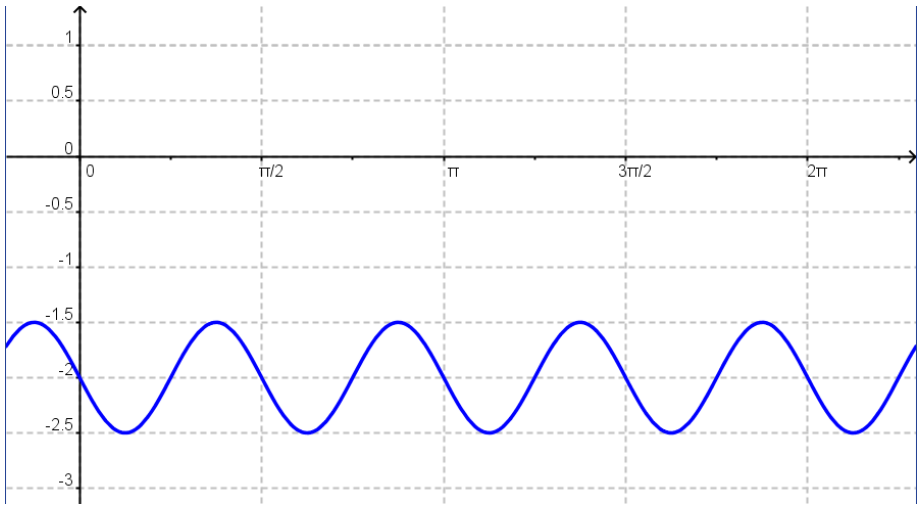


Domain	
Range	
Amplitude	
Period	
Equation of the Axis of the Curve	

b. $f(x) = 3\cos\left[2\left(x + \frac{\pi}{4}\right)\right] - 2$

Domain	
Range	
Amplitude	
Period	
Equation of the Axis of the Curve	

5) (4 marks) Determine a possible equation for the following sinusoidal function.



6) (2 marks) Express $\sin\left(\frac{\pi}{2}+\theta\right)$ as a single trigonometric function in simplest form.

7) (1 mark) Determine the exact value of $\cos\left(\frac{\pi}{3}+\frac{\pi}{6}\right)$

8) (10 marks) Determine the exact measure(s) of the angle θ, where $0 \le \theta \le 2\pi$.

a. $10\sec\theta + 2 = -18$

b. $\sin 2\theta + \cos\theta = 0$

Application

9) (9 marks) The height of a nail in a bicycle tire as it rotates around is periodic in nature. The radius of the tire is 20cm and at the current pedalling speed the tire rotates once every second.

a. Determine the equation of a sinusoidal function that models this situation assuming that the nail starts on the ground at time zero.

b. At what time(s) during the first two seconds is the nail at a height of 10cm?

10) (3 marks) A swimmer on a floating air mattress will follow the rise and fall of the waves in lake. When the person is on the top of the wave her feet are 0.5m above the average surface height of the lake. When she is in a trough her feet dig 0.5m into the water (-0.5m). The peaks of the waves are separated by two seconds. Create an equation of the sinusoidal function that models this movement assuming that she starts at the average surface height of the lake and heads upwards.

Inquiry

11) (8 Marks) Prove the following trig identities:

a. $\tan 2x - 2\tan 2x \sin^2 x = \sin 2x$ (3 marks)

b. $\sec^2 x - 2\sec x \cos x + \cos^2 x = \tan^2 x - \sin^2 x$ (5 marks)

12) (2 marks) Determine the exact value of $\sin 2\theta$ given that $\cos\theta = -\frac{12}{13}$ and $\pi \le \theta \le \frac{3\pi}{2}$ without determining the value of θ.