Name: _____ Original Score: _____ / 62 marks

→_____ % → ISM: _____ → IB: _____

Date: _____ Block: ____ After Corrections: _____ / 62 marks

MATH HONORS 2: UNIT 5 TEST – Trigonometry

SECTION A: Calculator Inactive – 45 minutes

1. Find the exact values of the following expressions: **(8 marks)**

a. $\tan\left(-\frac{7\pi}{6}\right)$ **(1M)**

b. $\cot 990°$ **(1M)**

c. $\sin\left(\frac{7\pi}{12}\right)$ **(2M)**

d. $\tan\left(\arccos\left(\sin\left(\arctan\left(-0.75\right)\right)\right)\right)$ **(3M)**

2. Given that $\sec\theta = \frac{-3}{2}$ and $\frac{\pi}{2} < \theta < \pi$, find the exact value of $\csc\theta$. **(3 marks)**

3. Prove the following identities: **(6 marks)**

a. $\cos^4\theta - \sin^4\theta = 1 - 2\sin^2\theta$ **(3M)**

b. $\dfrac{1}{1+\cos^2\theta} + \dfrac{1}{1+\sec^2\theta} = 1$ **(3M)**

4. Solve the following equations for all solutions in the given domains: **(9 marks)**

a. $\csc^2 x - 2 = 0,\ -180° \le x \le 180°$ **(3M)**

b. $\sin 2x + \sin x = 0,\ x \in \mathbb{R}$ **(3M)**

c. $3\cos\left(x - \dfrac{\pi}{2}\right) = \sqrt{3}\sin\left(x - \dfrac{\pi}{2}\right),\ 0 \le x \le 2\pi$ **(3M)**

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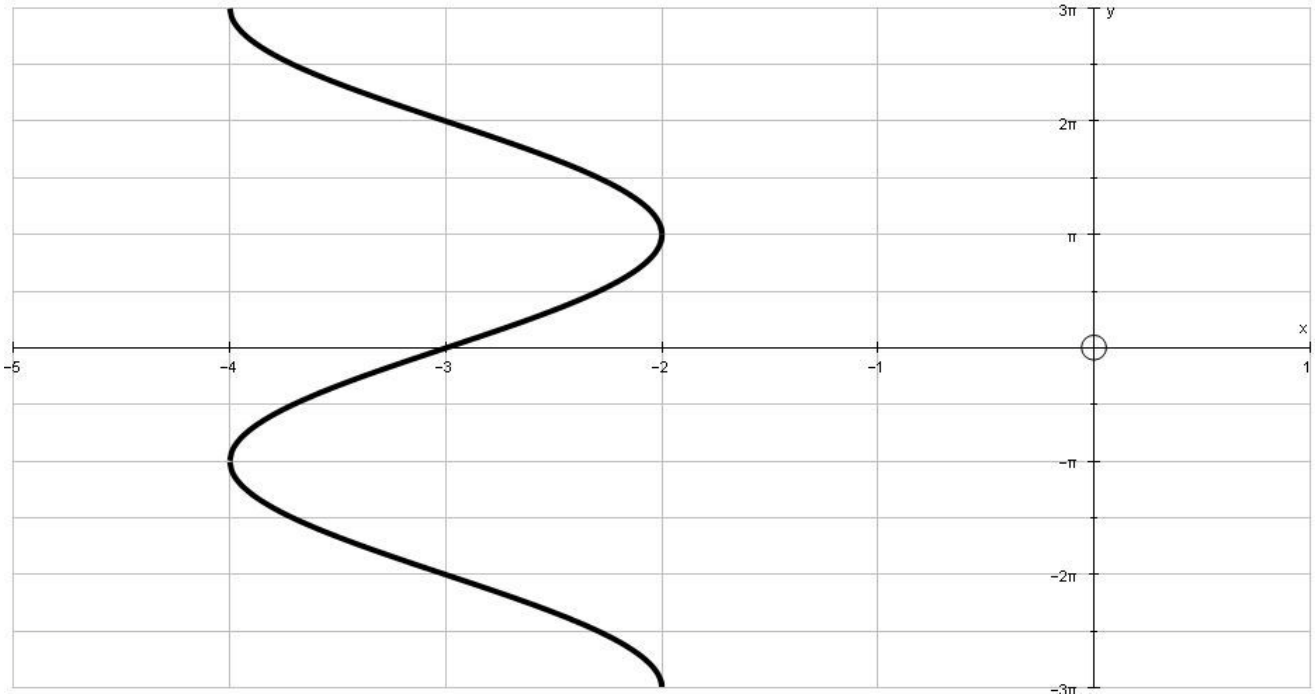
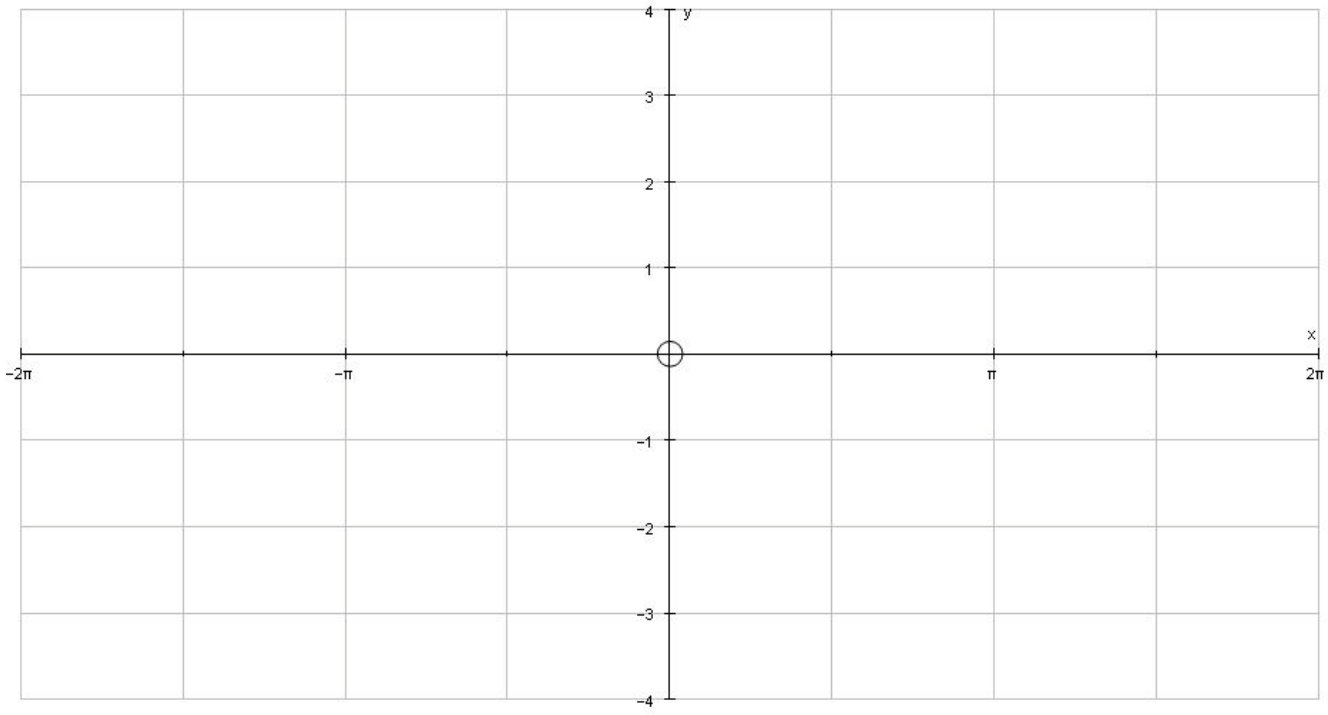
5. Find a function or relation that describes the following graph: **(3 marks)**

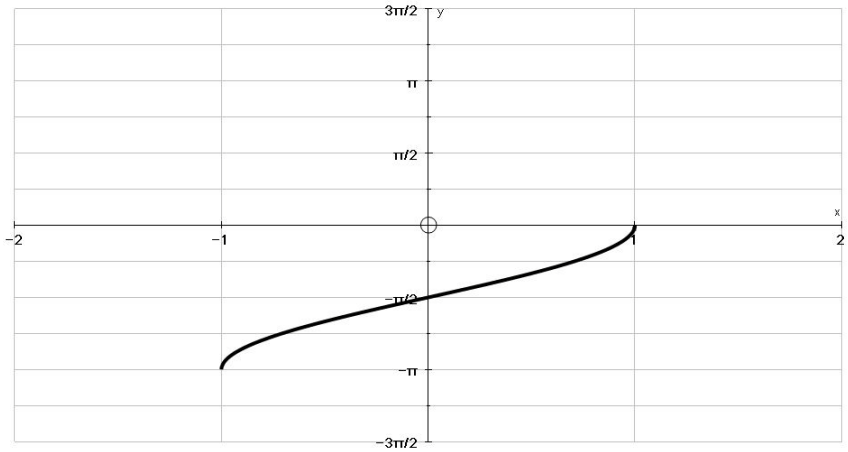


6. Sketch the graph of $y = \cot\frac{1}{2}x + 1$ for $-2\pi \le x \le 2\pi$ on the provided axes, clearly labeling any intercepts with coordinates and any asymptotes with equations. **(3 marks)**

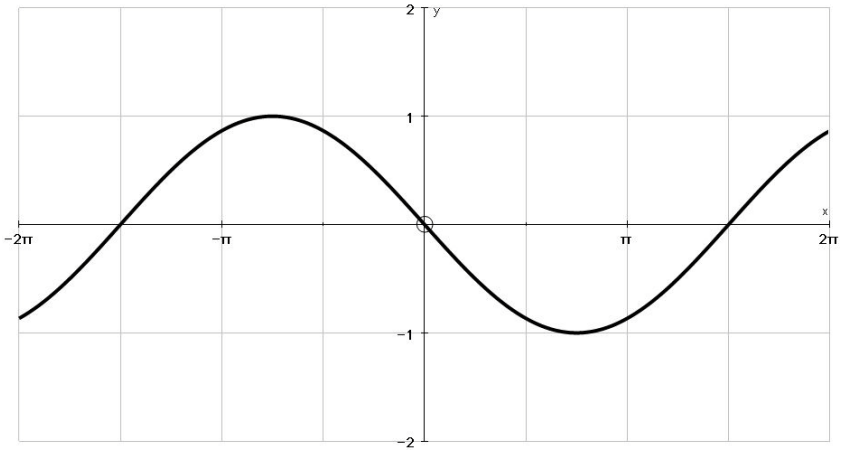


7. Match the given graphs to any three of the following nine equations: **(3 marks)**

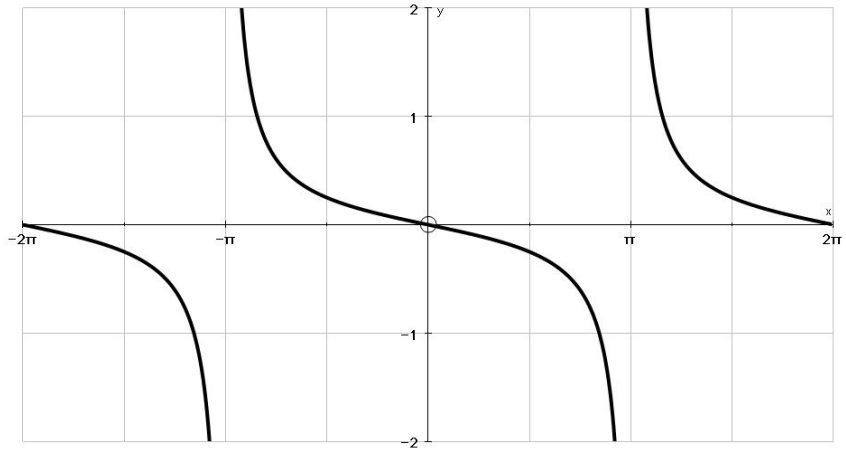
Graph **A**



Graph **B**



Graph **C**



$y = -\arctan x - \dfrac{\pi}{2}$ _____

$y = \cos\left(\dfrac{2}{3}\left(x - \dfrac{3\pi}{2}\right)\right)$ _____

$y = -\dfrac{1}{4}\tan\left(\dfrac{x}{2}\right)$ _____

$y = \sin\left(\dfrac{3}{2}\left(x - \dfrac{2\pi}{3}\right)\right)$ _____

$y = \arcsin x - \pi$ _____

$y = \arccos(-x) - \pi$ _____

$y = -4\cot 2x$ _____

$y = -0.5\tan(-0.25x)$ _____

$y = \sin\left(\dfrac{2}{3}x - \pi\right)$ _____

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8. Explain why only the cosine and secant ratios are positive in Quadrant IV. **(2 marks)**

9. Explain why the range of $y = \arccos x$ is $[0, \pi]$. **(2 marks)**

10. Prove that $4\cos^3\theta - 3\cos\theta = \cos 3\theta$. **(3 marks)**

A FEW HELPFUL TRIGONOMETRIC IDENTITIES

$$\csc A = \frac{1}{\sin A}$$
$$\tan^2 A + 1 = \sec^2 A$$
$$\cot^2 A + 1 = \csc^2 A$$
$$\sin(A + B) = \sin A \cos B + \sin B \cos A$$
$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$
$$\sin 2A = 2 \sin A \cos A$$
$$\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$

SECTION B: Calculator Active – 20 minutes

11. In ΔDEF, $d = 4.61$ cm, $e = 8.23$ cm, and $D = 20.9°$. Find the perimeter of ΔDEF. **(5 marks)**

12. An airplane is approaching a runway to land at an airport. The pilot notes that the angle of depression from the airplane to the start of the runway is $4.2°$, and the angle of depression to the end of the runway is $3.1°$. If the airplane is at an altitude of 197 meters, find the length of the runway. **(4 marks)**

13. Mr. Santowski and Mr. Atkinson have to build a new triangular stage for the finals of Battle of the Bands. The sides of the stage must be 12.5 meters, 18.4 meters, and 10.7 meters. Find the area of the stage. **(4 marks)**

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14. The temperature ($C°$) over a 24 hour day in Centraville is modeled by the function **(5 marks)**

$C = 17 - 6\cos\left(\frac{\pi t}{12} + 5\right)$, $0 \le t \le 24$, where t is the time in hours after midnight.

a. What is the temperature at 1:00 pm? **(1M)**

b. At what <u>times of day</u> is the temperature warmer than $20°C$? **(2M)**

c. What are the maximum and minimum temperatures reached, and when do these occur? **(2M)**

STUDENT SELF-EVALUATION

After the time allocated for writing this assessment has passed (or if you have finished early), answer the following questions:

a. Estimate the letter grade that you achieved on this assessment (e.g. A-, C+, etc.): _____

b. Which concepts did you have the most difficulty with during this assessment and/or this unit?

COMMUNICATION

In every formal assessment this year, 2 marks, 1 mark, or 0 marks will be awarded for the clarity of your communication in the presentation of your solutions and your written explanations.

On this assessment, you were awarded: _____ / 2 marks for communication.