
To receive credit you must Show appropriate work. Neatly organize your responses in the space provided. Answers should be exact unless otherwise stated. A blank Unit Circle has been provided on the back for non-graded use.

1. [20 points] Determine the exact value (no decimals) of the following expressions, if possible:

(a) $\cos\left(\frac{4\pi}{3}\right)$

(b) $\tan\left(-\frac{\pi}{6}\right)$

(c) $\arcsin\left(-\frac{\sqrt{3}}{2}\right)$

(d) $\cos\left(\arccos\left(\frac{\pi}{2}\right)\right)$. Briefly explain the reason for your answer.

2. [16 points] Express $\cot\left(\arcsin\left(\frac{5}{x-1}\right)\right)$ algebraically (ie- without any trigonometric functions).

Math 104 – Unit 3 Exam – Chapters: 4 & 5

3. [16 points] Evaluate all six trigonometric functions at α using the information: $\sec \alpha = -2$ and $\tan \alpha > 0$.

4. [16 points] Prove the following trigonometric identities:

(a) $\frac{\sin \theta}{1 + \cos \theta} + \frac{\cos \theta}{\sin \theta} = \csc \theta$

(b) $\cos x \tan^2 x + \cos x = \sec x.$

Math 104 – Unit 3 Exam – Chapters: 4 & 5

5. [16 points] Find all exact solutions of the equation below. Note: Double Angle Formula: $\cos(2\theta) = 2\cos^2\theta - 1$

$$\cos x = 1 + \cos(2x)$$

6. [16 points] Standing on flat ground at a point 44 ft. from the base of a building; You measure the angle of elevation from the ground to the bottom of the 2nd floor as 33° , and the angle of elevation from the ground to the top of the 2nd floor as 46° . Use this information to find the height of the 2nd story of the building. (Approximate with a decimal answer).

Math 104 – Unit 3 Exam – Chapters: 4 & 5

*** BONUS *** [3, 4, 3 and 5 points respectively]

(i) $\arcsin\left(\sin\left(\frac{\pi}{4}\right)\right)$. Explain the reason for your answer.

(ii) Consider the graph of: $f(x) = 4 - 7\cos\left(2x + \frac{\pi}{2}\right)$. Fill in the blanks about $f(x)$:

Vertical shift:

Amplitude:

Period:

Phase Shift:

(iii) Determine the exact value of $\arccos\left(\cos\left(\frac{5\pi}{3}\right)\right)$

(iv) Find the exact value of $\cos\left(\beta + \frac{\pi}{2}\right)$ using Formula: $\cos(x + y) = \cos x \cos y - \sin x \sin y$.

You are given information: $\csc \beta = \frac{7}{3}$ and $\frac{\pi}{2} < \beta < \pi$

Reference Unit Circle

