

MATH 007
Howard University
3:30 pm - 5:30 pm

Precalculus Final Examination

Spring 2017
Department of Mathematics
Tuesday, May 2, 2017

This exam consists of 12 questions. Answer all questions, and show your work neatly and coherently in the blue booklet provided. The total number of points is 200. Please note! In order for you to receive any credit for any answer, you must show the necessary work to support that answer.

1. (25 points) Consider the rational function $H(x) = \frac{3x^2 - 3x - 18}{x^2 - x - 2}$.
 - (a) Find the domain of H .
 - (b) Find the x - and y -intercepts of the graph of H .
 - (c) Find all vertical, horizontal, and slant asymptotes, if any, of the graph of H .
 - (d) Sketch the graph of the function.

2. (10 points) Solve $\frac{x-2}{x+3} \geq -4$. Express the selection in interval notation and graph the solution set on the real number line.

3. (25 points) Evaluate each of the following expressions without the aid of a calculator. Give exact values.
 - (a) $\cos 660^\circ$
 - (b) $\cos^{-1}\left(-\frac{1}{2}\right)$
 - (c) $\tan\left(-\frac{11\pi}{6}\right)$
 - (d) $\sin 195^\circ$
 - (e) $\sin\left(\arccos \frac{12}{13}\right)$

4. (15 points) Verify each of the following identities.
 - (a) $\csc x \tan x - \cos x = \sin x \tan x$
 - (b) $\sin(\pi - x) = \sin x$
 - (c) $\frac{\cot x \cos x}{\csc^2 x - 1} = \sin x$

5. (20 points) Find all solutions to each of the following equations in the interval $[0, 2\pi)$.
 - (a) $3 \sec^2 x - 4 = 0$
 - (b) $\sin^2 x - 2 \sin x - 3 = 0$

6. (20 points) For $y = 4 \sin\left(2x - \frac{\pi}{3}\right)$, do the following.
 - (a) Find the amplitude, period, and phase shift of f .
 - (b) Sketch one cycle of f .

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7. (25 points)

(a) Use Cramer's Rule to solve the following system of equations.

$$3x - 7y = 36$$

$$4x + 2y = 14$$

(b) Solve by substitution or any method of elimination:

$$2x + y - z = 9$$

$$x - 2y + z = -1$$

$$-x + 2y + 2z = -5$$

8. (10 points) Solve the system of equations

$$3x - 2y - 4z = 3$$

$$3x - 2y - 5z = 7$$

$$-x + y + 2z = 1$$

by using matrix inverse methods if the inverse (A^{-1}) of the coefficient matrix A is

$$A^{-1} = \begin{bmatrix} 1 & 0 & 2 \\ -1 & 2 & 3 \\ 1 & -1 & 0 \end{bmatrix}.$$

9. (10 points) Solve the system: $\begin{cases} x^2 - 4xy + 4y^2 = 1 \\ x + y = 4 \end{cases}$

10. (10 points) Evaluate the following determinant:

$$\begin{vmatrix} 2 & 4 & 2 \\ 1 & -3 & 0 \\ -5 & 5 & -1 \end{vmatrix}$$

11. (15 points) Solve the triangle with sides a , b , and c , and angles A , B , and C , given that $A = 80^\circ$, $B = 30^\circ$, and $b = 10$.

12. (15 points) A triangular plot of ground measures 50 meters by 65 meters by 80 meters. Find, to the nearest tenth of a degree, the measure of the angle opposite the longest side.