1. Graph each function below.
   a. $a(x) = -(x + 3)^2 + 3$
   b. $b(x) = -\sqrt{-x + 5} - 2$
   c. $c(x) = \ln(-x + 3) - 4$
   d. $d(x) = -(x - 1)^2(x + 4)$
   e. $e(x) = x^4 - 13x^2 + 36$
   f. $y = \frac{1}{3} \csc(4\pi \theta - \frac{\pi}{2})$
   g. $y = 3 \cot(x - 2)$

Amplitude: Max: Min: Period: HT: VT:

Period: Spaces: HT: VT:
2. Let \( f(x) = \frac{\sqrt{64-x^2}}{7-x} \) and \( g(x) = \sqrt{x^2 - 4} \). Calculate \( \left( \frac{f}{g} \right)(x) \) and \( \left( \frac{g}{f} \right)(x) \) and state the domain of each in interval notation.

3. Let \( f(x) = \frac{5}{\sqrt{x-5} - 3} \). State the domain of \( f(x) \) in interval notation.

4. Calculate the vertical asymptotes, \( x \)-intercepts, and slant/horizontal asymptote of \( a(x) = \frac{x^3 - 5x^2 - 4x + 20}{x^2 - 9} \).
5. Write the equation of a parabola in standard form with vertex \((3, -1)\) and directrix \(x = 5\).

6. Describe the difference between a sequence and a series. Describe the difference between an arithmetic and geometric sequence. Provide an example of each.

7. Calculate the determinant of each matrix below.
   
   a. \[
   \begin{bmatrix}
   -4 & -9 \\
   1 & 3
   \end{bmatrix}
   \]
   
   b. \[
   \begin{bmatrix}
   3 & -1 & 3 \\
   2 & -1 & 1 \\
   0 & 4 & 2
   \end{bmatrix}
   \]

8. Given that \(\theta = \frac{4\pi}{7}\), identify 3 coterminal angles. Also, identify the complement and supplement to the angle.
9. Find the exact value of \( \sin \left( \frac{23\pi}{12} \right) \).

10. If \( \cos \theta = \frac{2\sqrt{7}}{3} \) and \( \cot \theta < 0 \), what is the value of \( \csc \theta \)?

11. Solve each equation below over the interval \( [0, 2\pi) \).
   a. \( \sin 2x - \cos x = 0 \)  
   b. \( 4 \sin^2(1.5\theta) - 3 = 0 \)
12. Two avid hot air balloon fanatics are perched in the balloon's basket high above the ground. They have two potential landing fields, one to the left of the balloon at an angle of depression of 36°, the other to the right of the balloon at an angle of depression of 51°. If the two landing fields are 9,800 feet apart on level ground, calculating the current altitude above ground level of the ballooners.

13. A barge traveling at 14 kph on a northerly heading parallel to the coast spots a lighthouse bearing N 44° E at 10:30 AM. Hours later, the bearing from the barge to the lighthouse if S 15° E. If the nearest the barge will ever get to the lighthouse is 11.6 kilometers, calculate the bearing and distance from the barge to the lighthouse at noon.

Final Exam: Open-ended Topics

Graphing functions, Right Triangle Trig. application problems, & 4th M.P. material

4th M.P. Topics to Review

Solving Trig. Equations
Vectors
Polar Coordinates
Parametric Equations
Limits & Slope of Tangent Line