Fall 2014

Math 1300–Precalculus Final Exam

Your Name: _____

Instructions: Please justify all your answers. No partial credit will be awarded for answers without calculations or explanations. You may **Not** use any electronic technology. Please sign your name below signifying that you have read, understood and will abide by these directions and will not cheat.

Your Signature: _____

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Possible Points	6	10	10	10	15	10	10	15	10	10	10	10	20	20	166
Your Scores															

Problem 1: (6 points) Evaluate the following functions at the specified point. Find the exact values.

(1) $\sin\left(-\frac{5\pi}{6}\right)$

(2) $\tan(\pi)$

Problem 2: (10 points) Consider the first few terms of the sequence:

$$\frac{2}{3}, \frac{2}{9}, \frac{2}{27}, \frac{2}{81}, \ldots$$

(1) Assuming that the pattern established by the terms shown continues, can this sequence be classified as arithmetic, geometric or neither? (Justify your answer).

(2) Find a general formula for the n'th term of the sequence.

Problem 3: (10 points) Find the quotient and remainder when the polynomial $3x^3 - 5x + 3$ is divided by $x - 2$.

Problem 4: (10 points) Verify the identity:

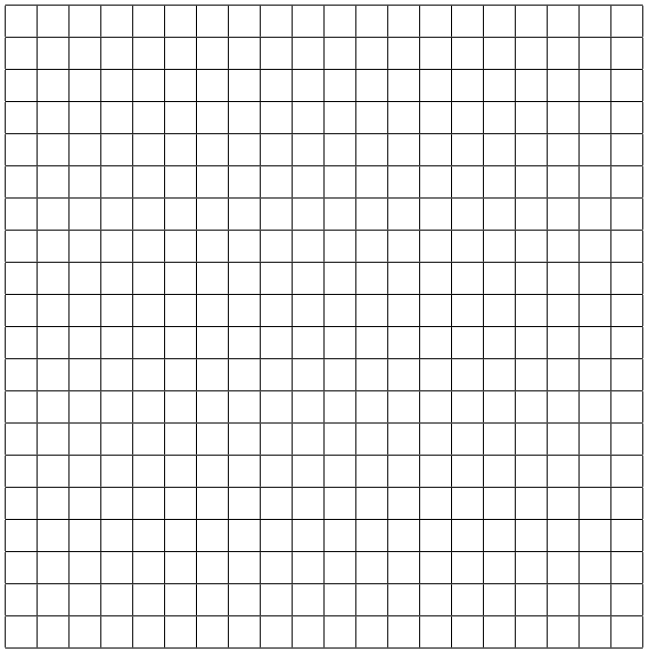
$$\frac{1}{1-\cos(\theta)} + \frac{1}{1+\cos(\theta)} = 2\csc^2(\theta)$$

Problem 5: (15 points) Consider the equation

$$2x^2 + 3y^2 - 4x + 24y + 32 = 0$$

(1) Put the equation in standard form and identify as a type of conic section.

(2) Graph the equation, label the foci, vertices and center.



Problem 6: (10 points) Rewrite the following expression as an algebraic function of x.

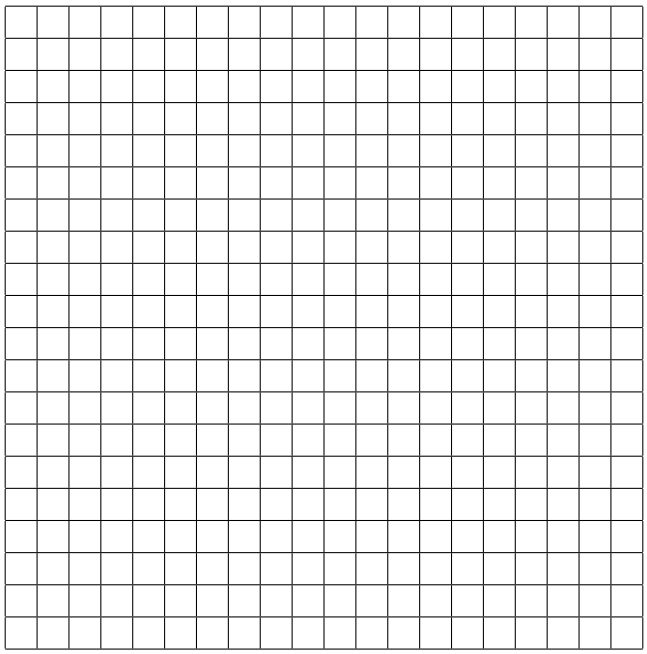
$$\sin\left(\arccos\left(\frac{x}{2}\right)\right)$$

Problem 7: (10 points) Solve the following equation for x.

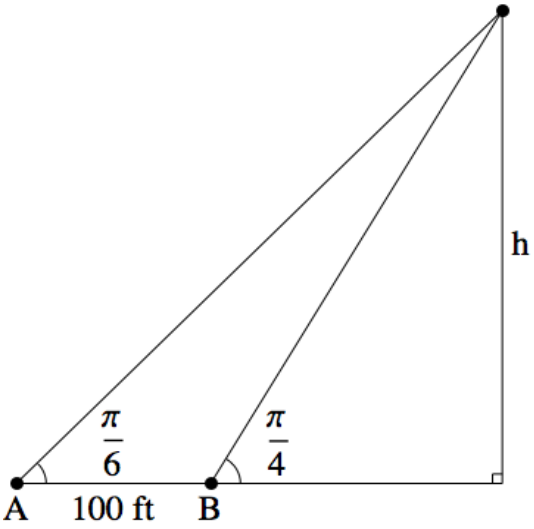
$$\log_3(x-4) + \log_3(x+4) = 2$$

Problem 8: (15 points) Graph each of the equations in the following system on a single graph. Then solve the system algebraically. Describe the connection between your algebra and your graph. Provide ticks and labels for your graph.

$$2x + y = 3$$
$$x - 3y = 0$$



Problem 9: (10 points) Elevation sightings are made from points A and B respectively. The angles of inclination, $\frac{\pi}{6}$ and $\frac{\pi}{4}$, are marked along with the distance between the sightings. Determine the height h from the given data.



Problem 10: (10 points) Let $f(x) = x(10 - 7x + x^2)$.

(1) Determine the values of x for which $f(x) \leq 0$ and express your answer in interval notation.

(2) Express the domain of the function $g(x) = \frac{1}{\sqrt{f(x)}}$ in interval notation.

Problem 11: (10 points) The function $f(x) = -7 + \sqrt[7]{4x - 5}$ is one to one on its domain.

(1) Find a formula for its inverse, $f^{-1}(x)$.

(2) Verify your formula is correct by computing and simplifying $f \circ f^{-1}(x)$.

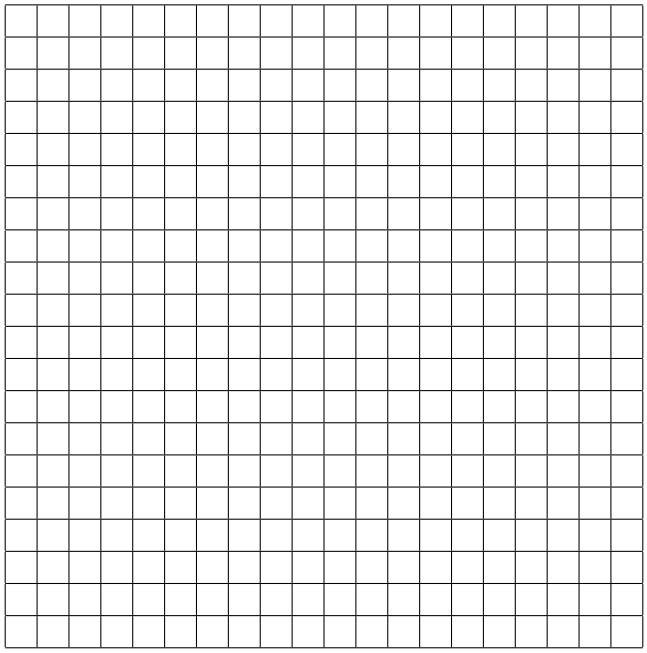
Problem 12: (10 points) Let $f(x) = 2x^2 - 4x - 1$.

(1) Put $f(x)$ in standard form and draw its graph.

(2) Identify the vertex and axis of symmetry in your graph of f.

(3) Identify the interval(s) on which f is increasing and separately decreasing.

(4) Is the vertex an absolute maximum or minimum? Explain.



Problem 13: (20 points) Consider the rational function

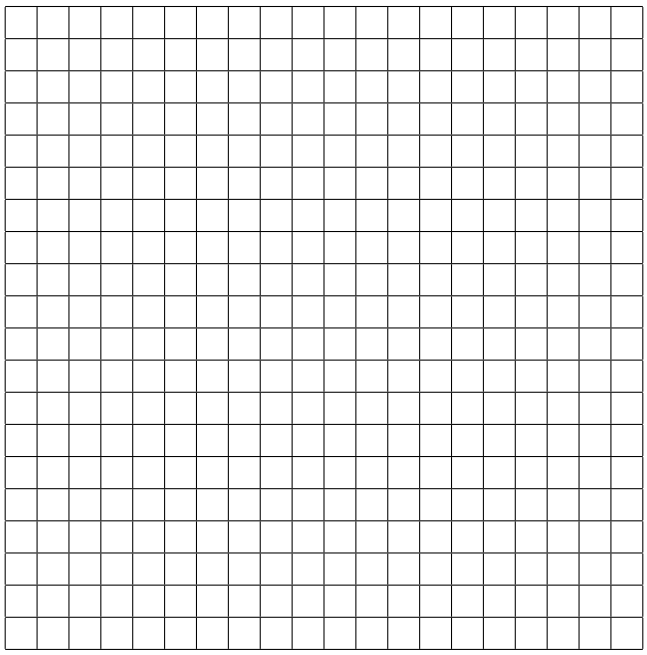
$$f(x) = \frac{3x^2 - 3x}{x^2 - 5x + 4}$$

(1) Express the domain of f in interval notation.

(2) Find the x and y intercepts of f.

(3) Find all vertical and horizontal asymptotes.

(4) Sketch a detailed graph of f.



Problem 14: (20 points) Use the method of transformations to sketch a detailed graph of each of following functions. First sketch the basic function and then sketch its transformation. Label all asymptotes and intercepts.

(1) Basic: $y = \log(x)$ and Transformed: $y = 4 - \log(2x + 1)$.

(2) Basic: $y = \sqrt{x}$ and Transformed: $y = 1 - \sqrt{1 - x}$.