Spring 2014/2015

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	Total
Possible Points	6	6	10	15	6	10	10	10	12	15	20	10	130
Your Scores													

Problem 1: (6 points) Given that $\tan(\theta) = 4$ and $\sec(\theta) < 0$, find the exact values of the six circular functions evaluated at θ.

$\sin(\theta) =$ _____ $\sec(\theta) =$ _____

$\cos(\theta) =$ _____ $\csc(\theta) =$ _____

$\tan(\theta) = 4$ $\cot(\theta) =$ _____

Problem 2: (6 points) Find the quotient and remainder when the polynomial $7x^4 - 5x^3 + 3x - 1$ is divided by $x - 2$.

Problem 3: (10 points) Solve

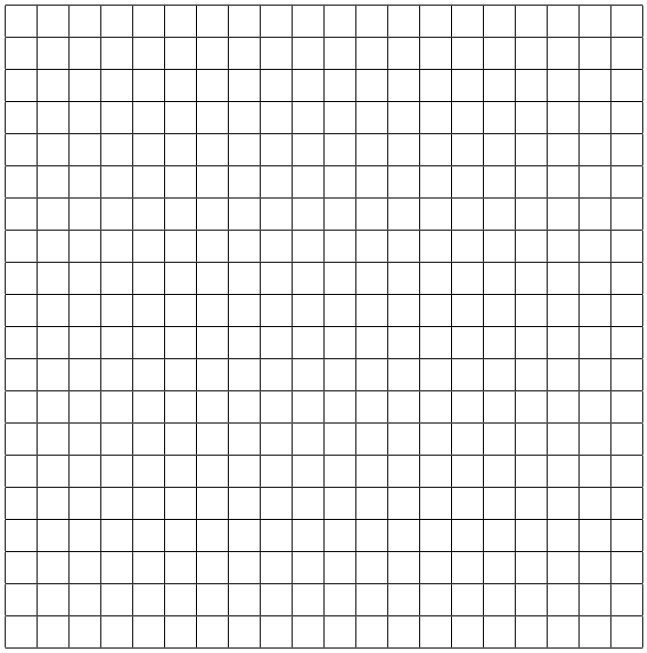
$$2\sin^2(x) = \sin(x) \quad \text{on} \quad [0, 2\pi]$$

Problem 4: (15 points) Consider the equation

$$9x^2 - 4y^2 - 36x - 24y - 36 = 0$$

(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 5: (6 points) Find the exact values of

(1) $\arccos\left(-\frac{\sqrt{3}}{2}\right)$

(2) $\arcsin\left(-\frac{1}{2}\right)$

Problem 6: (10 points)

(1) Use the properties of logarithms to re-write the expression

$$\log_2(x^3 - 4) + 2\log_2(x + 2) - 4\log_2(3x + 2)$$

as a single logarithm.

(2) Use the properties of logarithms to re-write the expression

$$\log_3\left(\frac{xy}{z^2\sqrt[3]{w}}\right)$$

so that the result does not contain any powers, products or quotients.

Problem 7: (10 points) Solve the inequality and express your answer in interval notation.

$$x + |2x - 3| < 2$$

Problem 8: (10 points) Use angle sum, angle difference or half angle identities to find the exact values of

(1) $\cos(\frac{\pi}{12})$

(2) $\sin(\frac{5\pi}{12})$

Problem 9: (12 points) Consider the function

$$f(x) = \frac{3x - 7}{x - 1}$$

(1) Find the domain of $f(x)$, write your answer in interval notation.

(2) Show that $f(x)$ is one to one on its domain.

(3) Find an explicit formula for the inverse function $f^{-1}(x)$.

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

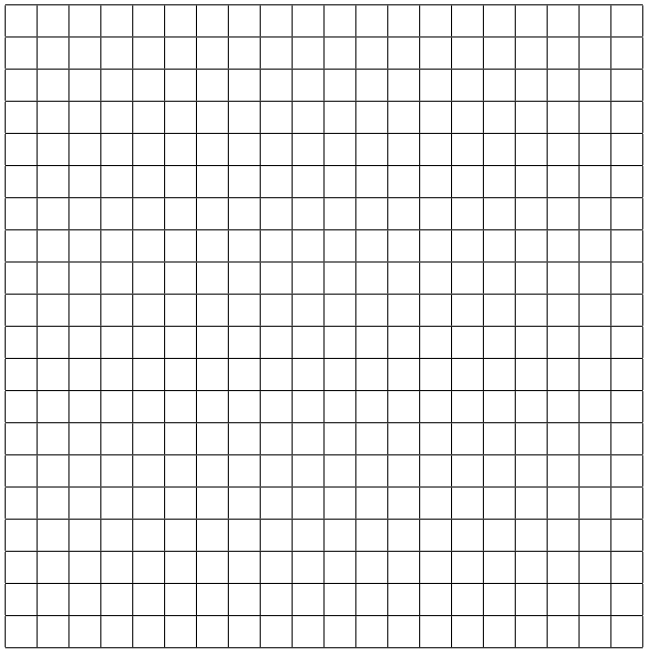
Problem 10: (15 points) Determine the values of c for which the function

$$f(x) = x^2 - 2x + c$$

(1) Has a unique real root. Express your answer in set notation and graph this case below.

(2) Has exactly two distinct real roots. Express your answer in interval notation.

(3) Has no real roots. Express your answer in interval notation.



Problem 11: (20 points) Consider the rational function

$$f(x) = \frac{x^2 + 4x + 3}{x^2 - 1}$$

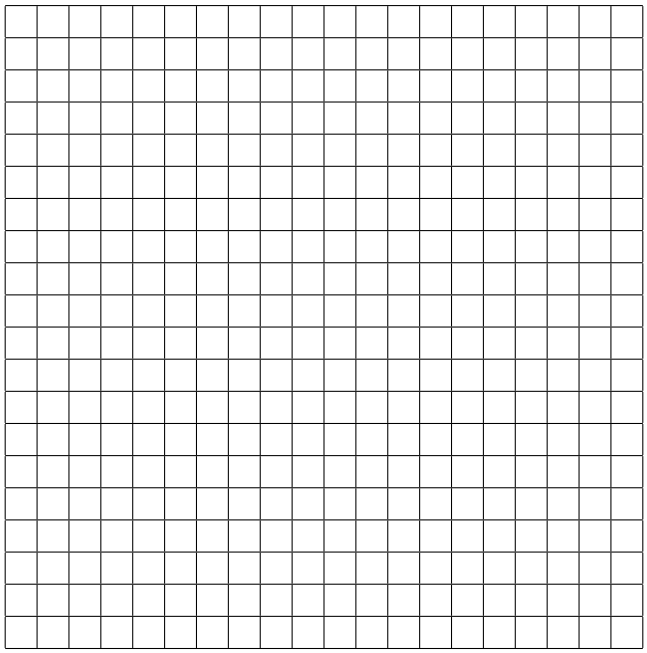
(1) Express the domain of f in interval notation.

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

(3) Find all vertical and horizontal asymptotes.

(4) Identify any holes.

(5) Sketch a detailed graph of f.



Problem 12: (10 points) Use the method of transformations to sketch a detailed graph of

$$g(x) = 3 - 2f(x-1)$$

where the graph of

$$f(x) = (x-1)^2(x+3)^2$$

is shown below. Track the four points indicated on the graph of $f(x)$ through the transformation.