Spring 2016

Math 1300–Precalculus Final Exam

Your Name: _____

Your Instructor: _____

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	10	10	12	10	10	15	10	15	12	14	12	10	10	10	160
Your Scores															

Problem 1: (10 points) Choose one of the following inequalities, (please circle your choice).

(A) $e^{2x} - 3e^x - 10 \leq 0$ (B) $\sin^2(\theta) < \frac{3}{4}$ on $[0, 2\pi)$

(C) $2x^2 - 3x \geq |2x - 1| - 1$ (D) $\frac{x-3}{x+2} \leq 0$

Solve the inequality using a sign diagram.

Problem 2: (10 points) Find the exact value of each sum

$$\sum_{k=0}^{100} \left(\frac{1}{2}\right)^k$$

$$\sum_{k=0}^{100} \frac{k}{2}$$

Problem 3: (12 points)

Choose, and circle, **One** Polynomial	Please Answer **ALL** four Questions
A). $p(x) = 8x^3 + 14x^2 - 7x - 6$ B). $p(x) = x^4 - x^3 - 7x^2 + x + 6$ C). $p(x) = 12x^3 - 8x^2 - 3x + 2$	1). Divide $p(x)$ by $(x - 2)$ 2). List all the **possible** rational roots of $p(x)$ 3). Factor $p(x)$ and write $p(x)$ as the product of its factors 4). Describe the end behavior of $p(x)$ in words and with sketches.

Problem 4: (10 points) A cell tower casts a 120 meter long shadow down a level road. The angle of elevation from the end of the shadow to the top of the tower is $\frac{\pi}{6}$. Find the height of the tower in meters.

Problem 5: (10 points) Find the exact value for each expression.

$$\sin\left(\arccos\left(-\frac{3}{5}\right)\right)$$

$$\arccos\left(\sin\left(-\frac{4\pi}{3}\right)\right)$$

Problem 6: (15 points)

1. Write the equation of the line that passes through the points $(-1, 5)$ and $(-1, 10)$

2. Write the equation of the line that passes through the points $(5, -3)$ and $(7, -3)$

3. List all the points that are common to **both** of the lines (1) and (2) above.

4. Find the equation of the line that passes through the points $(1, 2)$ and $(3, 1)$

5. Find the equation of the line perpendicular to (4) passing through $(1, -1)$

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

$\log_3(x + 2) - 2\log_3(x) = 0$

$4^{x-1} = 64$

Problem 8: (15 points) $f(x) = 2x^2 + 8x + 5$

(1) Complete the square to find the standard "vertex" form for $f(x)$

(2) What is the vertex (h, k) of this quadratic function?

(3) What is the equation of the axis of symmetry of this quadratic function?

(4) What is the maximum function value (it may be ∞) attained on the domain?

(5) What is the minimum function value (it may be $-\infty$) attained on the domain?

Problem 9: (12 points) Given $g(x) = \sqrt[5]{3x - 1}$

1. Write the domain of $g(x)$ in interval notation.

2. Demonstrate that $g(x)$ is one to one on its domain.

3. Find the inverse of $g(x)$, denoted by $g^{-1}(x)$.

4. Compute the function $g \circ g^{-1}$

Problem 10: (14 points)

- Find the function values of the piecewise function $f(x)$ at the points, A, B, C, D.

- Track the four points through the transformation and write your answers in the table on the right.

- Please list, in words, the component parts of the transformation $g(x) = 2f(1 - x) + 1$, e.g., scale by...

- Graph $f(x)$. Please draw and label tick marks on the axes provided.

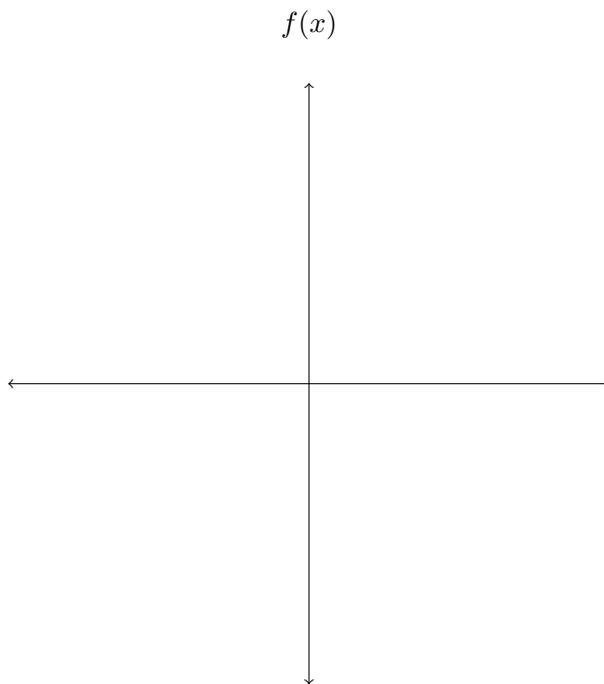| Name	x	$f(x)$
Point A	-1	
Point B	0	
Point C	1	
Point D	e	

$$f(x) = \begin{cases} -x^3 & \text{on} & [-1, 0) \\ \sin(2\pi x) & \text{on} & [0, 1) \\ \ln(x) & \text{on} & [1, e] \end{cases}$$

Name	$x = 1 - z$	$g(z)$
Point A		
Point B		
Point C		
Point D		

$f(x)$
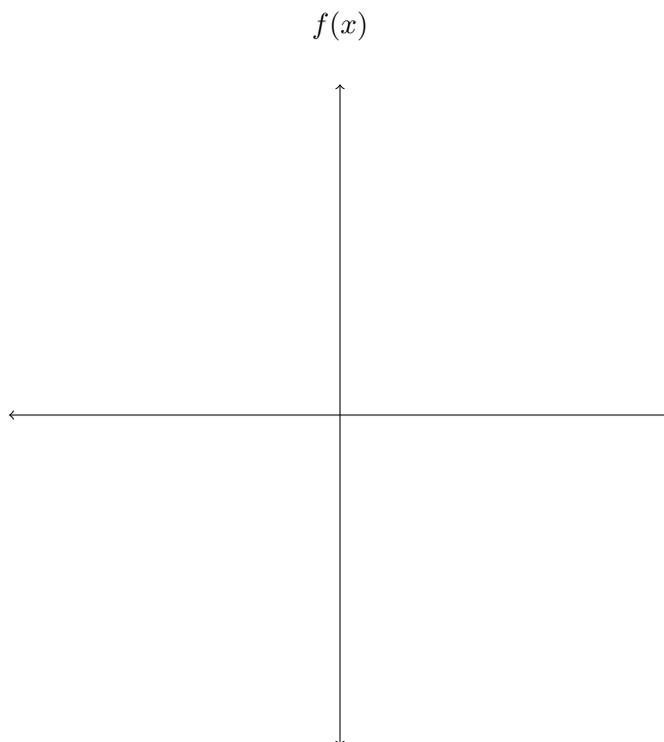
Problem 11: (12 points) For $f(x) = \dfrac{x^2 - x - 6}{(x+1)(x+3)}$

(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 and identify any holes.

(4) Sketch a detailed graph of f on the grid below.

$f(x)$

Problem 12: (10 points) Choose, circle and answer **one** of the following: Write the equation of

1. An ellipse with Center $(3,7)$, Vertex $(3,2)$, Focus $(3,3)$

2. A parabola with Vertex $(2,3)$, and Focus $(3,3)$

3. A hyperbola with Center $(3,7)$, Vertex $(3,3)$, Focus $(3,2)$

Problem 13: (10 points)

- Use the properties of logarithms to write $f(x) = 2\ln(x-3) + \log_e(y+2) - \ln(z)$ as a single logarithm.

- Use the properties of logarithms to expand $g(x) = \ln\left(\frac{x^2-1}{y^z \sqrt[3]{e}}\right)$ so that the expression does not contain any logarithms of products, powers, quotients or polynomials of degree greater than 1.

Problem 14: (10 points) $\tan(\theta) = 5/12$ with θ in the third quadrant. Find the exact values

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

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

$\tan(\theta) = 5/12$ $\cot(\theta) =$ _____