Fall 2016

Math 1300–Precalculus Final Exam

Your Name: _____

Your Instructors 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	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 pairs (please circle your choice).

(A) $e^{7x-8} \geq 2$ and $\log_6(x+4) + \log_6(3-x) = 1$

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(B) $\frac{1-\ln(x)}{x^6} \leq 0$ and $\frac{4}{1+3e^{-2x}} = 3$

Solve the inequality and express your answer in interval notation.

Solve the equation and express your answer in set (curly braces) notation.

Problem 2: (10 points) Given the sequence $11, 7, 3, -1, -5, \ldots$

1. Find an expression for the n^{th} term of the sequence.
2. Use your formula to explicitly find the 50^{th} term.
3. Find the sum of the first 50 terms of the sequence.

Problem 3: (12 points) Given

$$p(x) = x^3 + 6x^2 - 9x - 14$$

1. Completely factor $p(x)$, use the rational roots theorem to help you.
2. Sketch a graph of $p(x)$ and label the points where the graph intersects the x-axis and the y-axis.

Problem 4: (10 points) A superhero, standing on the ground, launches 50 feet of wire from a grappling gun, held at an angle of elevation of $\pi/3$ radians. The grapple hits and catches the top edge of the building.

1. How tall is the building?

2. How far from the base of the building is the superhero standing?

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

$\sin\left(\arcsin(1/2) + \arccos(1/2)\right)$

$\arccos\left(\tan\left(\dfrac{5\pi}{6}\right)\right)$

Problem 6: (15 points)

1. Write the equation of the line with slope 2 that passes through the point $(1, -7)$

2. Solve the equation $|2x + 1| = 3$

3. Solve the inequality $|x^2 - 9| \geq 6$

Problem 7: (10 points)

1. Given $f(x) = x^2 - x$, construct but **do not simplify**, the difference quotient for $f(x)$

2. Simplify the following difference quotient instead

$$\frac{5(x+h) + (x+h)^2 - (5x + x^2)}{h}$$

Problem 8: (15 points) $f(x) = 4x^2 - 24x + 3$

1. Complete the square to find the standard "vertex" form for $f(x)$
2. Sketch a graph of $f(x)$. Mark the vertex and indicate the axis of symmetry.

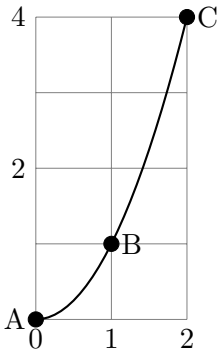
Problem 9: (12 points) Solve for x, y, and z

$$\begin{aligned} x + y + z &= 55 \\ y - x &= 7 \\ x + y - z &= 19 \end{aligned}$$

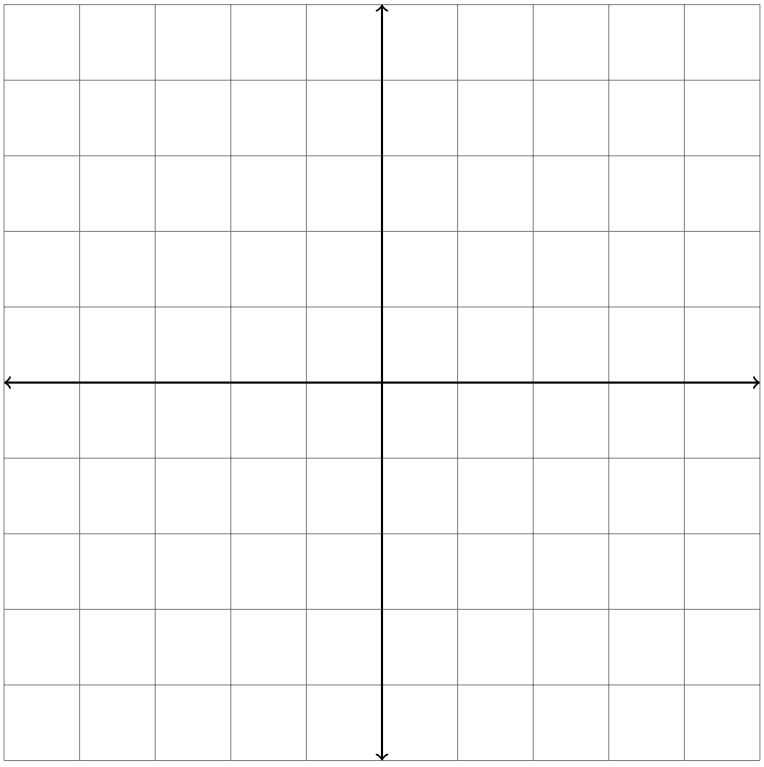
Problem 10: (14 points)

1. The graph of the parent function $f(x) = x^2$ is shown. The three points, A= $(0, 0)$, B= $(1, 1)$ and C= $(2, 4)$ are marked.
2. Explain in words, the sequence of operations that transform $f(x)$ into $g(x) = 2(x + 1)^2 - 4$
3. Graph $g(x)$ and label the coordinates of the three transformed points.

$f(x) = x^2$



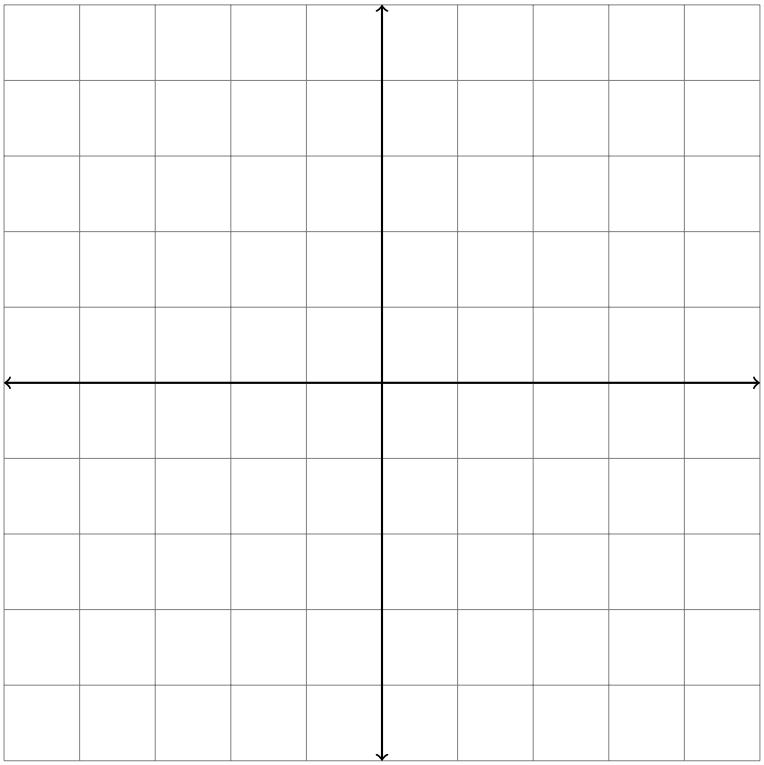
$g(x) = 2(x + 1)^2 - 4$



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

1. Express the domain of f in interval notation.
2. Find the vertical asymptote and the hole.
3. Find the horizontal asymptote.
4. Sketch the graph of f.
5. Solve the inequality $\frac{x^2-x-6}{x^2+x-2} < 0$, and express your answer in interval notation.

$$f(x) = \tfrac{x^2-x-6}{x^2+x-2}$$



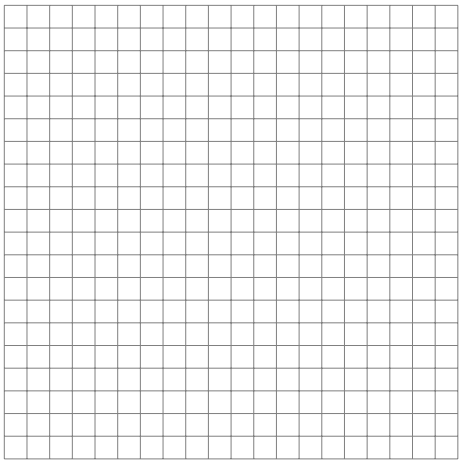
Problem 12: (10 points) Sketch the graph of each of the following conic sections. **Clearly** label all centers, vertices, foci, and asymptotes where appropriate.

1. $$\frac{(x+2)^2}{16} - \frac{(y-1)^2}{25} = 1$$

2. $$\frac{(y-2)^2}{4} = (x+1)$$

3. $$\frac{(y+1)^2}{9} + \frac{(x+3)^2}{16} = 1$$

1



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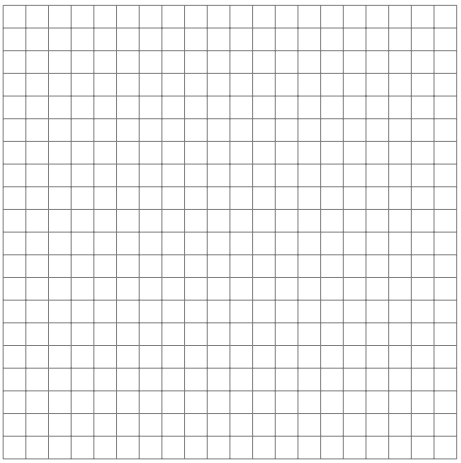

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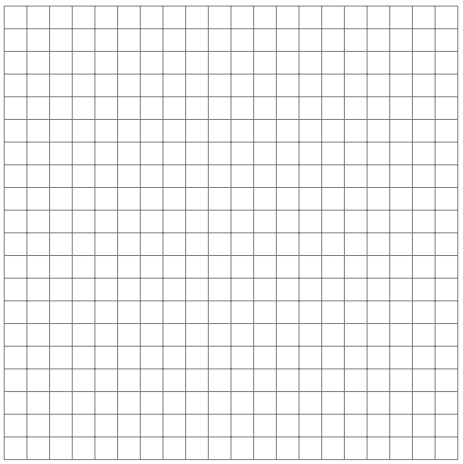

Problem 13: (10 points) Verify the following trigonometric identities. Show all your intermediate steps.

$$\sin(x) + \cot(x)\cos(x) = \csc(x)$$

$$\sin(2\theta) = \frac{2\tan(\theta)}{1 + \tan^2(\theta)}$$

Problem 14: (10 points) Given that $\csc(\theta) = 11$ with θ in the second quadrant. Find the exact values of all six trigonometric functions evaluated at θ.

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

$\cos(\theta) =$_____ $\csc(\theta) = 11$

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