Name_____ School_____

SENIOR DIVISION
Category 1: Exponents and Logarithms

CALCULATORS NOT ALLOWED

1. (2 pts) Rewrite $\log_a b = c$ in exponential form. 1. _____

2. (3 pts) Solve each of the following.

a) $\log_5 x = -2$ 2a. _____

b) $5^x = -2$ 2b. _____

c) 2c. _____

3. (5 pts) List the letter of the corresponding equation so that the solution to the equation goes in order from greatest to least.

a) $x^7 = 128$ b) $\log_5 x = -3$ c) $1.1^x = 1,000,000,000$

d) $\log_{10} x = 0$ e) $6^x = \frac{1}{216}$ f) $x^3 = 8000$

3. _____

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SENIOR DIVISION
Category 2: Higher Degree Functions

CALCULATORS NOT ALLOWED

1. (2pts) Solve for x if x is a real number.

$$2x^3 + 5x^2 + 18x = -45$$

1. _____

2. (3 pts) What is the remainder for:

$$(x^4 + 4x^3 - 7x^2 + 8x - 5) \div (2x + 6)\ ?$$

2. _____

3. (5pts) Write the given function as a product of linear factors.

$$f(x) = 2x^4 - 9x^3 + 3x^2 - 36x - 20$$

3. _____

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SENIOR DIVISION

Category 3: Trigonometric Functions, Identities and Equations

CALCULATORS NOT ALLOWED

1. (2pts) Simplify:

$$sin\,(\theta)\cdot cos\,(\theta)\cdot tan\,(\theta)\cdot csc\,(\theta)\cdot sec\,(\theta)\cdot cot(\theta)$$

1. _____

2. (3pts) Solve for θ, in radians, on the interval $[0, 2\pi]$.

$$sin\,(\theta - \tfrac{\pi}{4}) - 1 = 0$$

2. _____

3. (5 pts) Find the x and y intercepts for the following function if x is measured in degrees.

$$f(x) = cos(4x)$$

x-intercepts: _____

y-intercepts: _____

Names _____ School _____

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SENIOR DIVISION
Category 4: Conic Section Team (Pass in only one paper)

1. (2 pts) For the following equation, identify the shape, give the center and describe its distance characteristics.

$$x^2 + y^2 + 2x - 6y + 6 = 0$$

1 Shape _____

1 Center _____

1 Distance _____

2. (3 pts) Find the focus or foci for the following conic section.

$$y^2 + 12x + 4y + 76 = 0$$

2. _____

3. (5 pts) Give the equations, in vertex form, for an ellipse and a hyperbola that meet the following conditions.

1) The center is (-4,7).
2) The vertices are (-4, 10) and (-4, 4).
3) The foci are two units from the vertices.

Ellipse:

3a. _____

Hyperbola:

3b. _____