Name_____ School_____

SENIOR DIVISION
Category 1: Irrational Numbers and Radicals

# CALCULATORS NOT ALLOWED

1. (2 pts) Simplify: $\sqrt{\sqrt[3]{\sqrt[4]{1\times10^{48}}}}$ 1. _____

2. (3 pts) Write the letter of any irrational number: 2. _____

(A) $\sqrt[3]{216}$ (B) $\sqrt[5]{1,000,000}$ (C) $\sqrt{400}$ (D) $\sqrt{8}\times\sqrt{32}$ (E) $\sqrt[7]{2187}$

3. (5 pts) Find the sum: 3._____

$$\sqrt{8}+\sqrt{48}-\sqrt{125}+\sqrt{144}+\sqrt{200}-\sqrt{243}+\sqrt{320}-\sqrt{196}$$

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SENIOR DIVISION
Category 2: Algebraic Fractions

1. (2pts) Find the difference: $\frac{3x+7}{5x-1}-\frac{2x+3}{3x+1}$ 1. _____

2. (3 pts) Give an expression for "?" that would make the expression below simplify to 2.

$$\frac{\left(3x^2y^3\right)^4\left(6xy^2\right)^3}{\left(324x^2y^3\right)(?)^3}$$

2. _____

3. (5pts) Decompose into a sum with two linear denominators:

$$\frac{-3x-15}{x^2+x-2}$$

3. _____

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Category 3: Sequences, Series and Progressions

1. (2pts) Find the sum of $\sum_{n=0}^{6} 6(-2)^n + 3$ 1. _____

2. (3pts) Find the missing terms in the geometric sequence:

8, _____, _____, _____, 19.53125

3. (5 pts) Find the sum of the following series. If it is diverging, write "diverging". If it is converging, find the sum.

$$\sum_{i=0}^{\infty} 20\left(\frac{1}{2}\right)^{i-1}$$

3. _____

Names _____ School _____

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SENIOR DIVISION
Category 4: Quadratics in One Variable (Pass in only one paper)

1. (2 pts) Find the exact value of the discriminant for the quadratic equation:

$$-9x^2 - \sqrt{5}x = \frac{3}{2}$$

_____

The solution(s) to this quadratic equation will be:

Rational Irrational Complex/Imaginary
(circle one)

2. (3pts) Solve for $x$. Give only exact answers. 2. _____

$$\frac{x+3}{x-6} = \frac{2x+3}{8}$$

3. (5pts) Give the smallest positive value for "?" so that the given equation meets the criteria.

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| |

3a. One solution 3a. _____

3b. A positive rational value for $\sqrt{b^2 - 4ac}$ 3b. _____

3c. Two complex solutions where the coefficient of the imaginary term is rational 3c. _____