Name:

Algebra II
Examination 2

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TUESDAY, SEPTEMBER 21, 2021

The examination contains five problems which are worth 20 points each, and two bonus problems worth an additional 20 points each, for a maximum of 100 points.

- *ALL* answers must the justified with appropriate words, sentences, and/or computations.

- *DO NOT* write a negative number inside a square root.
  Make appropriate use of the symbol i if necessary.
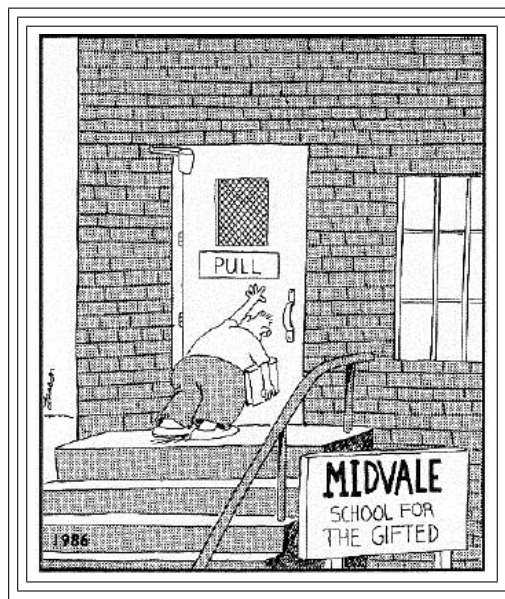
Prob 1	Prob 2	Prob 3	Prob 4	Prob 5	Bonus1	Bonus 2	Total Score

Problem 1. (Definitions)
State the precise definition, as given in class, of the following terms.

   (a) Rational Number

   (b) Real Number

   (c) Circle

   (d) Parabola

Problem 2. (Solving Equations)
Find all real numbers x which satisfy the following equations.
Using correct set notation, write the solution set.
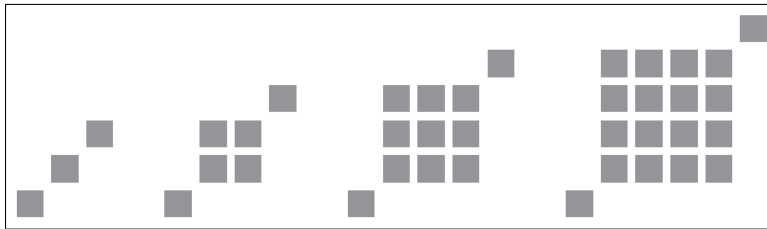
(a) $7x - 3 = 3x + 12$

(b) $2x^2 + 72 = 0$

(c) $x^2 - 10x + 25 = 0$

(d) $2x^2 + 3x - 15 = x^2 + 5x$

(e) $x^2 - 7x + 3 = 0$

Problem 3. (Patterns)
Consider the following pattern of floor tiles.

(a) How many tiles will there be in the fourth design?

(b) How many tiles will exist in the nth design? Why?

(c) Given 200 tiles, what is the largest integer n for which the nth design can be made? Why?

(d) Is this type of function linear, quadratic, or exponential?

Problem 4. (Equation of a Line and Circle)
Justify your answer by showing your work.
  Let $A = (6, 2)$ and $B = (-1, 5)$.

(a) Find the slope of the line through A and B.

(b) Find the point-slope equation of the line through A and B.

(c) Find the slope-intercept equation of the line through A and B.

(d) Find the distance from A to B.

(e) Find the equation of the circle centered at A and passing through B.

Problem 5. (Equation of a Parabola)
Consider the parabola whose equation is $y = 2(x - 5)^2 - 2$.

(a) Find the vertex of the parabola.

(b) Find the y-intercept of the parabola.

(c) Find the x-intercepts of the parabola.

(d) Find the focus of the parabola.

Problem 6. (Bonus)
The locus of the equation $y = x^2 - 6x - 55$ is a parabola.

(a) Find its vertex.

(b) Find its roots.

(c) Find its focus and directrix.

Problem 7. (Bonus - Word Problem)

Nancy walks 15 meters diagonally across a rectangular field. She then returns to her starting position along the outside of the field. The total distance she walks is 36 meters. What are the dimensions of the field?