

Exam 2

Name: _____

Rules:

- Partial credit will be awarded, but you must show your work.
- No notes, books, or cell phones are allowed.
- Calculators are allowed.

NOTE: The exam is formatted in order to provide plenty of space. A complete answer does **not** need to fill the given space. Indeed, it is not necessary.

Problem	Possible	Score
1	15 + 2 extra credit	
2	15	
3	20 + 2 extra credit	
4	20	
5	15	
6	15	
Total	100	

1. (15 points) Solve the quadratic equation below using the Arabic method of completing the square. Include the algebraic steps and the accompanying figure.

equation: $x^2 + 12x = 10$

Extra Credit (2 points): Describe two ways in which the solution above is different from the modern method of completing the square.

2. (15 points) Describe Omar Khayyam's contributions to algebra, approximately when this occurred, how his approach is similar and different from our modern approach.

(a) approximate date:

(b) description of contributions:

(c) similar to a modern approach:

(d) different from a modern approach:

3. (20 points)

(a) Explain what is meant by a **reduced cubic**.

(b) Find the reduced cubic for $x^3 + 6x^2 + x = 1$.

(c) What was the importance of the reduced cubic to Girolamo Cardan?

(d) Describe two ways in which the Cardan's formulas for solving cubic equations catalyzed further mathematical research. Include names, dates and mathematical topic/result.

4. (20 points)

(a) Find the locus of points, $P(x, y)$, satisfying the four line problem where the lines are

$$L_1 : x = 0, L_2 : y = 0, L_3 : x = 5, L_4 : y = 10,$$

d_i is the distance between P and L_i , and the constraint is $d_1 d_2 = d_3 d_4$.

(b) Find two specific points in the locus.

(c) These “ n line problems” (4 line problem, 5 line problem, etc) appear in René Descartes’ *La Géométrie*. Why? What was Descartes attempting to demonstrate?

(d) **extra credit (2 points)** Describe in words or by a graph what the locus of points from part (a).

5. (15 points) Give an example of a mathematician who solved a problem we could consider a typical calculus 1 problem prior to 1700. Describe their approach and compare it to our modern approach to the problem.

(a) Name of mathematician and approximate dates:

(b) Description of calculus problem:

(c) Their method/strategy of solution:

(d) Similarities:

(e) Differences:

6. (15 points) List five significant mathematical contributions of Isaac Newton and/or Gottfried Leibniz. Indicate which of the two discovered/developed the concept. Make sure you include **at least one contribution from each person**.

(1):

(2):

(3):

(4):

(5):