Midterm 1

April 4 2013, 17:30 – 18:40

Name and the student number:

Q 1. (3 pts) *Which period of time is called "Middle Ages" ? Into which periods it is subdivided ? Which period is called "Renessance" ?*

Q 2. (6 pts) *Give (approximately) time of the following events.*

Empire of Charlemagne

Foundation of the first universities in Europe.

Establishing of the first Academies of Science in Europe.

The first books printed.

Discovery of Americas by Columbus.

The period of disasters in Europe (Great Famine, Black Death, etc.)

Q 3. (8 pts) *What was understood by a "University" in Medieval Europe ?*

What are "seven liberal arts", and what was their role in Medieval education ?

What does mean "Scolasticism" ?

Why a Doctor Degree in Science is called "Ph.D." (why "Philosophical") ?

Q 4. (6 pts) *Explain what does mean or give a formula (if any)*
"Modus Indorum"

"Trillion" and "Quadrillion"

"Basel Problem"

"Zeta-function"

Q 5. (5 pts) *Find the discriminant of the cubic equation $x^3 + 6x - 6 = 0$. What does its sign say about the number of real roots ?*

Q 6. (6 pts) *Describe the role of del Ferro, Fiore, Tartalia, Cardano, and Ferrari in the history of solution of cubic and quartic equations.*

Q 7. (6 pts) *Explain how do you understand the difference between the following mathematical subjects*

Analytic and Synthetic Geometry

Calculus and Mathematical Analysis

Usual and Analytic Number Theory

Q 8. (6 pts) *Who have written the following books and when?*

Liber Abaci

Summa de arithmetica, geometria, proportioni, et proportionalita

On Revolutions of the Celestial Spheres

Ars Magna

Discourse on the Method

Philosophia Naturalis Principia Mathematica

Q 9. (5 pts) *Formulate the Little and the Great theorems of Fermat.*

Q 10. (4 pts) *Who invented the "Rule of signs" ? What does it say about polynomial* $x^4 + 2x^3 - 3x^2 - x + 5$ *?*

Q 11. (32 pts) *Give the names of scientists related to the following events and discoveries ? Approximate their time.*

Theory of Linear Perspective.

The idea of graph of a function.

Decimal Fractions were brought to Europe.

Divergence of Harmonic Series.

Invention of Logarithms.

Words "billion", "trillion", "quadrillion", etc.

Negative and complex roots of equations were recognized.

The coefficients of polynomials are denoted by letters.

Using signs "+" and "-" for arithmetical operations.

The laws of motion of planets on elliptic orbits were stated.

The laws of falling of objects along parabolic trajectories.

The Fundamental Theorem of Algebra.

Equation of tangent lines to a curve.

The Law of Large Numbers.

The geometric meaning of negative numbers (on the coordinate line).

The power function x^a *with an arbitrary real number* a.

Machines for calculations

Probability theory.

Generalized binomial theorem.

Power series for $\exp(x)$.

Concept of Limit and Continuity.

Analytic number theory.

Concept of Double Integral.

Q 12. (33 pts) *Approximate time of life of the following scientists. What do you know about their life, fields of research, and the most important contribution ?*

Leonardo of Pisa

Descartes

Fermat

Pascal

Newton

Leibniz

Jacob and Johann Bernoulli

Euler