This examination paper

has 5 numbered pages

Available time:

2 hours 30 minutes

ERASMUS UNIVERSITY ROTTERDAM

Entrance examination Mathematics level 1

for International Bachelor in Communication and Media

PRACTICE EXAM

This exam consists of 15 questions. Only 8 out of the 15 questions have to be answered. Each question is worth at most 3 points. In order to pass the examination a score of 12 points is sufficient.

In case a candidate answers more than the above mentioned number of questions, the points for the superfluously answered questions are not added to the total. In such cases, the examiner decides which of the answers will be regarded as superfluous.

All necessary steps, formulas, substitutions, diagrams or graphs leading to your answer must be written down. Furthermore, questions containing the words "solve", "derive" or "calculate" require an exact answer; a decimal approximation is not allowed.

The use of a so called "graphing calculator" or "programmable calculator" is not permitted. "Simple" scientific calculators are allowed.

Please answer <u>exactly 8</u> of the following 15 questions.

Question 1

Solve the following equations:

(a) $x^2 + 10x + 24 = 0$

(b) $x^2 + 10x - 24 = 0$

(c) $x^2 - 10x + 24 = 0$

Question 2

Determine the derivative, with respect to the variable x, of each function below:

(a) $f(x) = \sqrt[3]{5 - 3x}$

(b) $f(x) = \frac{1}{x^2} + x^2 + \sqrt{x}$

(c) $f(x) = \dfrac{x^2 + x - 12}{x - 3}$

Question 3

(a) Determine the formula of the straight line through the points $(-3, 3)$ and $(6, 0)$.

(b) Determine the formula of the straight line through the point $(1, 1)$, and parallel to the previous line.

(c) Determine the formula of the straight line through the point $(1, 1)$, and perpendicular to the previous lines.

Question 4

(a) The sequence of numbers below contains the results that a group of 21 students obtained for a math exam. Determine the mode, the median, and the mean of this sequence.

$$2, 3, 3, 4, 4, 5, 5, 5, 6, 6, 6, 6, 6, 7, 7, 7, 8, 8, 9, 9, 10.$$

(b) Some time later an extra result was added to this sequence. The added result is smaller than 6. Describe if/how this will affect the mode, median, and the mean.

Question 5

Solve each of the systems of equations below.

(a) $\begin{cases} x - 5y &= -1 \\ 3x + 4y &= 16 \end{cases}$

(b) $\begin{cases} 2x + 3y &= 2 \\ x - \frac{3}{2}y &= 0 \end{cases}$

Question 6

Write as a single fraction and simplify as much as possible:

(a) $2 + \dfrac{1}{x+2}$

(b) $\dfrac{1}{\sqrt{13^2 - 5^2}} + \dfrac{5}{12}$

(c) $\dfrac{4x^4}{x^6} + \dfrac{2\sqrt{x}}{x^2\sqrt{x}} + \dfrac{8}{\sqrt{x^4}}$

Question 7

Given are the functions $f(x) = \sqrt{2x - 1}$ and $g(x) = x - 2$.

(a) Calculate $f(-1), f(1), f(3), f(6), g(-1), g(1), g(3)$ and $g(6)$

(b) Sketch, in the same figure, the graphs of the functions f and g.

(c) Calculate all points of intersection of the graphs of f and g.

Question 8

(a) In the (x, y)-plane draw the region given by

$$y \le -x \ \text{ and } \ y \ge \frac{1}{2}x - 6 \ \text{ and } \ y \ge 3 - 4x.$$

(b) Compute for each of the three vertices of this region the x- and y-coordinate.

Question 9

Given is the function $f : \ x \to \ 4\sin\left(\frac{x - \pi}{2}\right)$.

(a) Determine the equilibrium value, the amplitude and the period of this function.

(b) Calculate the zeros of f.

Question 10

Given is the function $f : x \to |2x - 1| - |x - 2|$. Sketch the graph of this function.

Question 11

(a) An amount of 10 000 euros is deposited at a monthly interest of 0.4 %. How much money will this account hold, three years later?

(b) Capital K is deposited at an annual interest rate of 4%. Interest is compounded once a year. In fifteen years time the capital has grown to an amount of 108 056.62 euro. Compute the principal capital K.

Question 12

Solve the following equations:

(a) $x^{2/3} = 25$

(b) $\left(\frac{1}{4}\right)^x = 64$

(c) $x^{1/5} = \frac{1}{4}$

Question 13

An unbiased die is rolled 6 times.

(a) Calculate the possibility of rolling 6 sixes.

(b) Calculate the possibility of rolling exactly one six.

(c) Calculate the possibility of rolling at least 4 sixes.

Question 14

The decay of the radio-active element Polonium-209 is described by the formula $I(t) = I_0 \cdot (0.9933)^t$, with t in years, and where I_0 denotes the initial quantity of radiation intensity.

(a) Calculate the half-life period of Polonium-209 in years.

The radio-active element Polonium-210 decays at a much faster rate: its half-life period is equal to 138 days.

(b) Compute, accurately to two decimal places, the daily decay of Polonium-210, i.e. calculate the percentage of the initial quantity of radiation intensity that has disappeared in one single day.

(c) Compute, accurately to two decimal places, the yearly decay of Polonium-210.

Question 15

A glass jar contains 3 red, 4 white, 5 green and 6 blue marbles. At random, four marbles are drawn from the jar (without putting them back).

(a)   Calculate the probability that all four marbles drawn are green.

(b)   Calculate the probability that every color is drawn.

(c)   Calculate the probability that 2 of the marbles drawn are green and 2 are blue.

(d)   Calculate the probability that only red and/or white marbles are drawn.