

Mathematics

Questionnaire א

Instructions for examinees

א. Duration of the exam: One hour and 45 minutes.

ב. Exam structure and breakdown of points:

This exam has five questions in the topic areas:

Algebra and Differential and Integral Calculus.

You must answer three questions –

$$3 \times 33\frac{1}{3} = 100 \text{ points}$$

ג. Material that may be used during the exam:

(1) A non-graphing calculator. You may not use the programming options of a programmable calculator. Use of a graphing calculator or the programming options may lead to the disqualification of the exam.

(2) Formula sheets (attached).

(3) A Hebrew-foreign language / foreign language-Hebrew dictionary.

ד. Special instructions:

- (1) Do not copy the question; only indicate the number of the question you are answering.
- (2) Start each answer on a new page. Write the steps of the solution in your answer booklet, even when the calculations are done with a calculator. Explain all of your work, including calculations, in detail and in a clear and organized fashion. Lack of detail may lower your score or disqualify the exam.
- (3) For draft paper, use the answer booklet or paper you receive from the proctors. Use of other draft paper may lead to the disqualification of the exam.

Good Luck!

/Continued on the next page/

מתמטיקה

שאלון ג

הוראות לנבחן

א. משך הבחינה: שעה ושלושה רבעים.

ב. מבנה השאלון ומפתח ההערכה:

בשאלון זה חמש שאלות בנושאים:

אלגברה, חשבון דיפרנציאלי ואינטגרלי.

עליך לענות על שלוש שאלות –

$$3 \times 33\frac{1}{3} = 100 \text{ נקודות}$$

ג. חומר עזר מותר בשימוש:

(1) מחשבון לא גרפי. אין להשתמש

באפשרויות התכנות במחשבון הניתן לתכנות.

שימוש במחשבון גרפי או באפשרויות התכנות במחשבון עלול לגרום לפסילת הבחינה.

(2) דפי נוסחאות (מצורפים).

(3) מילון עברי-לועזי/לועזי-עברי.

ד. הוראות מיוחדות:

(1) אל תעתיק את השאלה; סמן את מספרה בלבד.

(2) התחל כל שאלה בעמוד חדש. רשום במחברת את שלבי הפתרון, גם כאשר החישובים מתבצעים בעזרת מחשבון. הסבר את כל פעולותיך, כולל חישובים, בפירוט ובצורה ברורה ומסודרת.

חוסר פירוט עלול לגרום לפגיעה בציון או לפסילת הבחינה.

(3) לטיוטה יש להשתמש במחברת הבחינה או בדפים שקיבלת מהמשיגים. שימוש בטיוטה אחרת עלול לגרום לפסילת הבחינה.

בהצלחה!

/המשך מעבר לדף/

Questions

Note! Explain all of your work, including calculations, clearly and in detail.
Lack of detail may lower your score or lead to the disqualification of the exam.

Answer three of the questions 1-5 (each question – $33\frac{1}{3}$ points).

Note! If you answer more than three questions, only the first three answers in your answer booklet will be graded.

Algebra

1. The length of a given rectangle is 9 cm greater than its width.

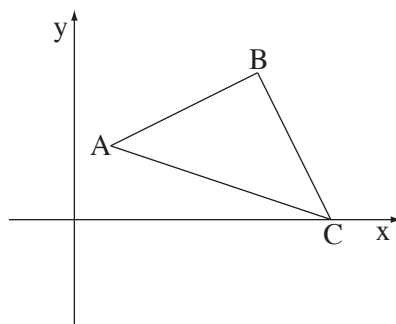
If we reduce the rectangle's length by 20% and increase its width by 25%, we will have formed a square.

- א. Find the width of the rectangle.
- ב. Calculate the area of the square that will be formed.

2. The following information is given
for the right triangle ABC ($\sphericalangle ABC = 90^\circ$):

A (2, 4) , B (10, 8) and

Vertex C is located on the x-axis
(see figure).



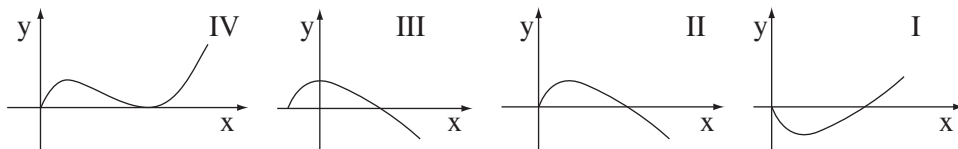
- א. Find the coordinates of Point C.
- ב. Find the equation of the circle whose diameter is AC.
- ג. Is Point B located on the circle that you found for Item ב? Explain.

Differential and Integral Calculus

3. The function $f(x) = 2\sqrt{x} - x$ is given.

- א. (1) Find the domain [תחום ההגדרה] of the function.
 - (2) Find the points at which the graph of the function intersects the axes.
 - (3) Find the extremum [נקודת קיצון] of the function, and determine what type of extremum it is.
- ב. Below are four graphs I, II, III and IV.

Which of these graphs depicts the given function? Explain.

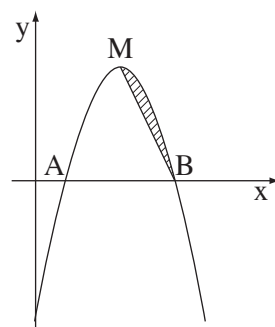


- ג. The line $y = k$ is given (k is a parameter). Determine for which values of k the line will intersect the given function at two different points.

4. The graph of the parabola $y = -x^2 + 6x - 5$ intersects the x -axis at Points A and B (see figure).

Point M is the maximum point of the parabola.

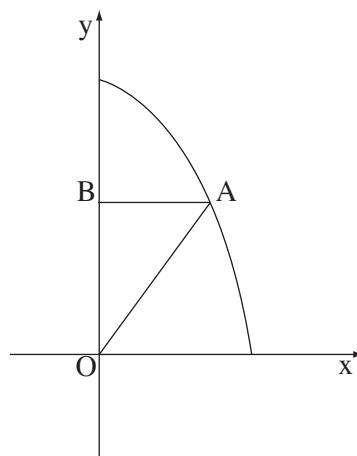
- א. Find the coordinates of Points M and B.
- ב. Calculate the size of the area bordered by the parabola and Line MB (the shaded area in the figure).



5. Given: the graph of the function $y = -x^2 + 27$
 in the first quadrant.

A line that is parallel to the x-axis intersects the
 graph of the function at Point A, which is
 located in the first quadrant, and intersects the
 y-axis at Point B.

Point A is connected to the origin O (see figure).



- א. When the area of Triangle AOB is
 the largest it can possibly be, what is
 the length of Segment AB?
- ב. What is the greatest possible area of Triangle AOB?

Good Luck!

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בהצלחה!

זכות היוצרים שמורה למדינת ישראל
 אין להעתיק או לפרסם אלא ברשות משרד החינוך

Note!

**Question 6 is only for students who have been
given permission to take the adapted exam.
(Purple sticker)**

You must answer three of the questions 1-6.

6. The derivative of the function $f(x)$ is $f'(x) = 3x^2 + 2x - 2$.

Given: $f(2) = 8$

א. Find $f(x)$.

ב. The figure to the right shows the graph of the
function $f(x)$.

Calculate the size of the area bordered by the
graph of the function and the x-axis (the shaded
area in the figure).

