

Mathematics

3 Points — Third Questionnaire

Instructions for examinees

א. Duration of the exam: Two hours

ב. Exam structure and breakdown of points:

This exam has six questions in the topic areas:

Algebra and Differential and Integral Calculus.

You must answer four questions —

$$4 \times 25 = 100 \text{ points}$$

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

3 יחידות לימוד — שאלון שלישי

הוראות לנבחן

א. משך הבחינה: שתיים.

ב. מבנה השאלון ומפתח ההערכה:

בשאלון זה שש שאלות בנושאים:

אלגברה, חשבון דיפרנציאלי ואינטגרלי.

עליך לענות על ארבע שאלות —

$$4 \times 25 = 100 \text{ נקודות}$$

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) לטייטה יש להשתמש במחברת הבחינה או בדפים שקיבלת מהמשגיחים. שימוש בטייטה 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.

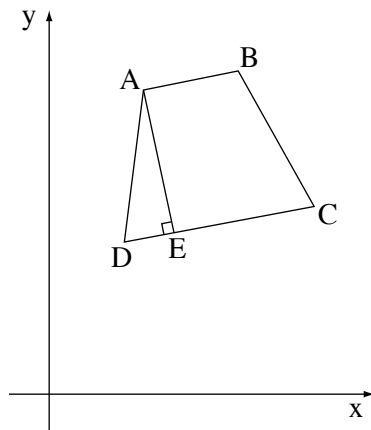
Answer four of the questions 1-6 (each question – 25 points).

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

Algebra

1. A merchant purchased a certain number of shirts at a price of x shekels per shirt and paid a total of 1200 shekels.
 The next time he placed an order, the merchant increased the number of shirts that he bought by 20. This allowed him to receive a discount of 10% per shirt.
 The total payment for the second order was 420 shekels higher than the total amount paid for the first order.
 - א. Express the number of shirts that were purchased in the first order in terms of x .
 - ב. What was the price per shirt before the discount?

2. The figure on the right shows a quadrilateral ABCD whose vertices are:
 - (5, 16)
 - (10, 17)
 - (14, 10)
 - (4, 8)
 - א. Match each vertex with the corresponding letter in the figure.
 - ב. (1) Find the slopes of the four sides of the quadrilateral.
 (2) Explain why Quadrilateral ABCD is a trapezoid.
 - ג. We know that AE is a height of the trapezoid. Find:
 - (1) the equation of AE.
 - (2) the coordinates of Point E.



3. The figure to the right shows a circle whose center is Point M (in the first quadrant). The circle is tangent to the x-axis at Point B.

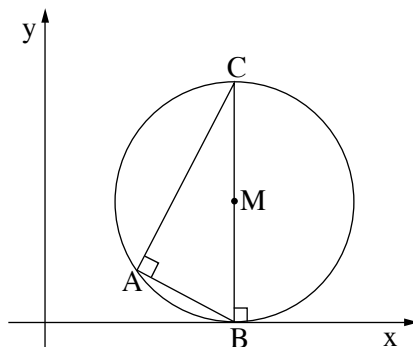
AB and AC are two chords [מיתרים] in the circle that are perpendicular to one another.

BC is a diameter of the circle.

- א. Given: The equation of the line on which Chord AB lies is $y = -\frac{1}{2}x + 4$.
 Also given: $BC = 10$.

- (1) Find the coordinates of Point B.
- (2) Find the coordinates of Point C.
- (3) Find the equation of the circle.

- ב. (1) Find the equation of the line on which Chord AC lies.
 (2) Find the coordinates of Point A.



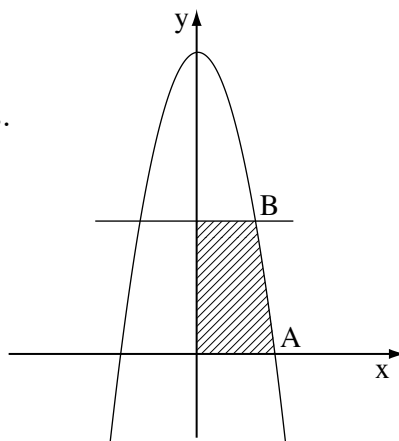
Differential and Integral Calculus

4. Given: the function $f(x) = x - 2\sqrt{x} - 3$

We also know that the graph of the function intersects the x-axis at the point (9, 0).

- א. (1) What is the domain [תחום ההגדרה] of the function?
 (2) Find the point at which the graph of the function intersects the y-axis.
- ב. Find the internal extremum [נקודת הקיצון הפנימית] of the function and determine what type of extremum it is.
- ג. Sketch a graph of the function.
- ד. For which values of x is the function positive?

5. The figure to the right shows a graph of the function $f(x) = -x^2 + 16$.
Point A is one of the points at which the graph of the function intersects the x-axis.
Point B is one of the points at which the line $y = 7$ intersects the graph of the function (see figure).



- א. Find the coordinates of Point A and Point B.
- ב. Determine the size of the area bordered by the graph of the function, the line $y = 7$, the x-axis and the y-axis (the shaded area in the figure).
6. The sum of three positive numbers is 18.
The second number is 2 times greater than the first number.
- א. Use x to represent the first number and express the third number in terms of x .
- ב. Find the value of x for which the product [מכפלת] of the three numbers will be greatest.

Good Luck!

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בהצלחה!

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