

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, but do 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 lead to disqualification of 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.

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) לטיוטה יש להשתמש במחברת הבחינה או

בדפים שקיבלת מהמשיגים.

שימוש בטיטה אחרת עלול לגרום לפסילת

הבחינה.

בהצלחה!

Good Luck!

Questions

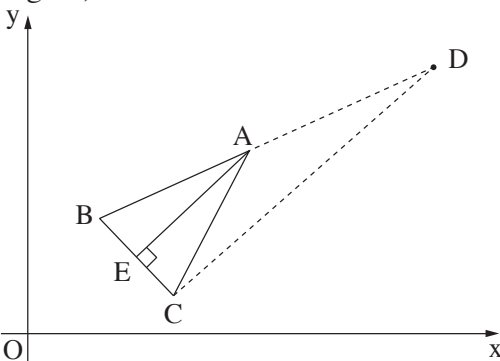
Note! Explain all of your work, including calculations, clearly and in detail.
 Lack of detail may lower your score or lead to the disqualification of your exam.

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

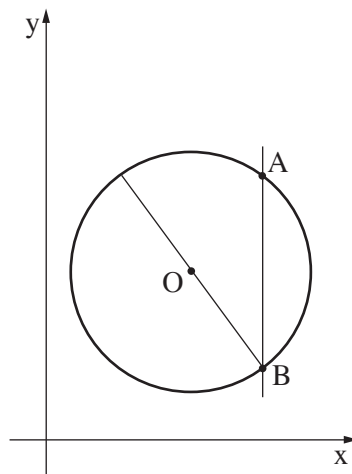
1. Danny wanted to buy a total of 20 pencils and pens.
 Each pencil costs 10 shekels. The price of a pen is 20% higher than the price of a pencil.
 The total cost of the pencils and pens is 214 shekels.
 - א. How many pens and how many pencils did Danny want to buy?
 - ב. When Danny was about to pay, he discovered that he had only 200 shekels on him.
 The shop assistant offered Danny a discount of 9% on the pencils.
 After this discount, was the 200 shekels that Danny had sufficient to buy all of the pencils and pens that he wanted?
2. The points A (6 , 5) and B (2 , 3) are the vertices of an isosceles triangle [משולש שווה-שוקיים] ABC ($AB = AC$).
 AE is the height to the base BC (see figure).
 The equation of AE is $y = x - 1$.
 - א. Find the equation of the side BC.
 - ב. (1) Find the coordinates of the point E.
 (2) Find the coordinates of the vertex C.
 - ג. Given: the point D (10 , 7)
 - (1) Show that DC is perpendicular to BC.
 - (2) Calculate the area of the trapezoid AECD.



3. Given: a circle whose center is $O(6, 7)$

Point $A(9, 11)$ is located on the circle (see figure).

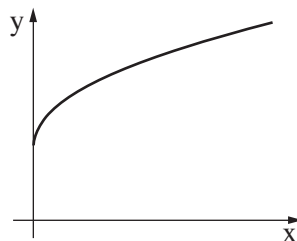
- א. (1) Calculate the length of the radius of the circle.
 (2) Write out the equation of the circle.
- ב. The line $x = 9$ intersects the circle at an additional point, B (see figure).
 Find the coordinates of Point B .
- ג. A diameter [קוטר] of the circle was drawn through Point B .
 Find the equation of this diameter.
- ד. Calculate the area of the triangle AOB .



Differential and Integral Calculus

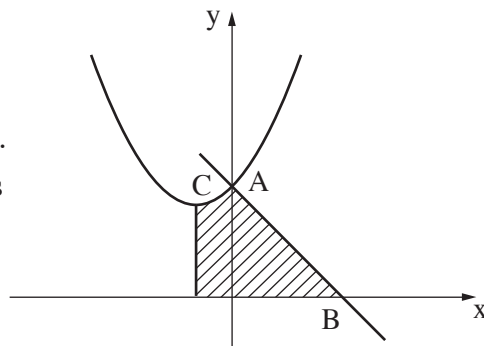
4. The figure to the right shows the graph of the function $f(x) = 2\sqrt{x} + 3$.

- א. What is the domain [תחום ההגדרה] of the function?
- ב. Find the point at which the graph of the function intersects the y-axis.
- ג. Derive the function and show that the function has no internal extrema [נקודות קיצון].
- ד. A tangent to the graph of the function was drawn through a point whose x-coordinate is 1.
 Find the equation of the tangent.
- ה. Does the line $y = 2$ intersect the graph of the function? Explain.



5. The parabola $y = x^2 + 2x + 6$ intersects the y-axis at Point A (see figure).

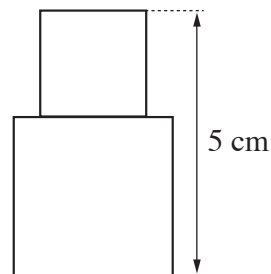
- א. Find the coordinates of Point A.
- ב. A line with a slope -1 is drawn through Point A.
 - (1) Find the equation of the line.
 - (2) The line intersects the x-axis at Point B.Find the coordinates of Point B.



- ג. Point C is the minimum point of the parabola. Find the coordinates of Point C.
- ד. A line that is perpendicular to the x-axis was drawn through Point C. Find the area of the region bounded by the parabola, the perpendicular line, the x-axis and the line AB (the shaded region of the figure).

6. Given: a shape composed of two squares, one on top of the other
 (The squares may be identical or different in size.)
 The height of the shape is 5 cm (see figure).

- א. Use x to denote the length of a side of the lower square and express the length of a side of the upper square in terms of x .
- ב. For what value of x will the area of the shape be smallest?
- ג. Calculate the smallest possible area of the shape.



Good Luck!

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בהצלחה!

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