The State of Israel
Ministry of Education
Exam Type: *Bagrut*
Exam Date: Summer 2024
Exam Number: 035382
Appendix: Formula sheets for 3 points
English Translation (3)

Note: This exam has special instructions. Answer the questions according to these instructions.

Mathematics

3 Points – 3rd Exam

Instructions

א. Duration of the exam: Two and a half hours.

ב. Exam structure and breakdown of points:
This exam has six questions on the following topics: Algebra, Differential and Integral Calculus.
Answer four questions – each question is worth 28 points.
The maximum number of points you can earn is 100.

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 programming options may lead to the disqualification of your 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 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 your exam.

Write in the answer booklet only. Write "טיוטה" at the top of every page you use for rough work.
If you use pages outside the answer booklet for rough work, your exam may be disqualified.

Good Luck!

מדינת ישראל
משרד החינוך
סוג הבחינה: בגרות
מועד הבחינה: קיץ תשפ"ד, 2024
מספר השאלון: **035382**
נספח: דפי נוסחאות ל־3 יחידות לימוד
תרגום לאנגלית (3)

שימו לב: בבחינה זו יש הנחיות מיוחדות. יש לענות על השאלות על פי הנחיות אלה.

מתמטיקה

3 יחידות לימוד – שאלון שלישי

הוראות

א. משך הבחינה: שעתיים וחצי.

ב. מבנה השאלון ומפתח ההערכה:
בשאלון זה שש שאלות בנושאים – אלגברה, חשבון דיפרנציאלי ואינטגרלי.
יש לענות על ארבע שאלות – לכל שאלה 28 נקודות.
סך הנקודות לא יעלה על 100.

ג. חומר עזר מותר בשימוש:
(1) מחשבון לא גרפי. אין להשתמש באפשרויות התכנות במחשבון שיש בו אפשרות תכנות.
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) אין להעתיק את השאלה; יש לסמן את מספרה בלבד.
(2) יש להתחיל כל שאלה בעמוד חדש. יש לרשום במחברת את שלבי הפתרון, גם כאשר החישובים מתבצעים בעזרת מחשבון.
יש להסביר את כל הפעולות, כולל חישובים, בפירוט ובצורה ברורה ומסודרת.
חוסר פירוט עלול לגרום לפגיעה בציון או לפסילת הבחינה.

יש לכתוב במחברת הבחינה בלבד. יש לרשום "טיוטה" בראש כל עמוד המשמש טיוטה.
כתיבת טיוטה בדפים שאינם במחברת הבחינה עלולה לגרום לפסילת הבחינה.

בהצלחה!

Questions

Answer four of the questions 1–6 (each question – 28 points).

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

Algebra

1. A travel agency is offering a vacation package that includes a flight and hotel accommodation.
The price of the travel agency's vacation package is 3,290 shekels.
In this package the price of the hotel accommodation is 35% higher that the price of the flight.

א. Find the price of the flight in the vacation package offered by this agency.

Yossi, a travel agent, booked several vacation packages through this travel agency.
He was given a 15% discount on the price of the flight in each vacation package he booked
(the price of hotel accommodation remained the same).

ב. How much did Yossi pay for one vacation package after the discount?

Michael, who is also a travel agent, booked vacation packages through another travel agency.
He paid 3,300 shekels for each vacation package he booked.
Yossi booked 11 more vacation packages than Michael.
The sum that Yossi paid for all the packages he booked is equal to the sum that Michael paid for all the packages he booked.

ג. How many vacation packages did Michael book?

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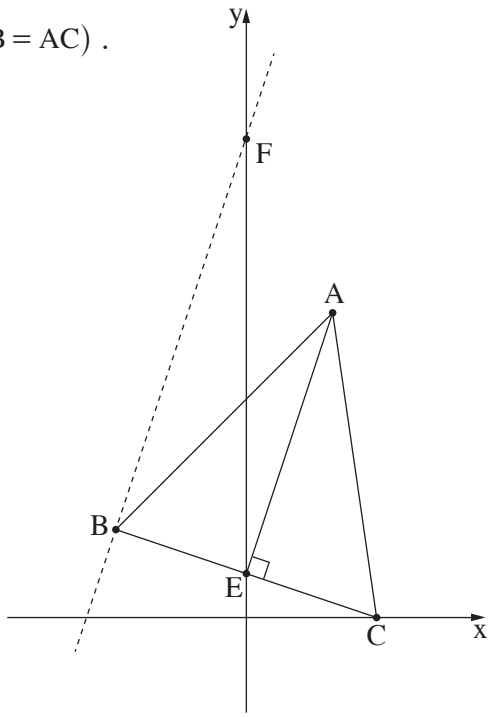
2. The figure on the right shows an isosceles triangle ABC $(AB = AC)$.
AE is the height to the base BC.
Vertex C is located on the x-axis.
We know that $A(4, 14)$, $E(0, 2)$.



א. **(1)** Find the slope of AE.

(2) Find the equation of Line BC.

ב. Find the coordinates of Vertex C.

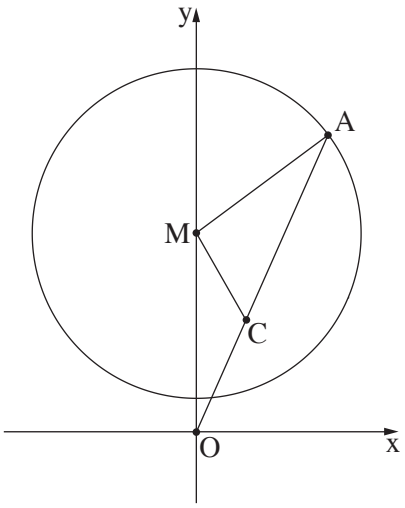
ג. Find the coordinates of Vertex B.

A line was drawn through Vertex B, parallel to Height AE (the dotted line in the figure).
This line intersects the y-axis at Point F.

ד. Find the equation of Line BF.

ה. Find the perimeter of Triangle FBE.

3. Consider a circle whose center M is located on the y-axis.
Point O is the origin. Point A is located on the circle, as shown in the figure to the right.
Point C is located on Line AO.
We know that the equation of Line MC is $y = -1.75x + 12$.



א. Find the coordinates of M, the center of the circle.

We know that the length of the radius of the circle is 10.

ב. Find the equation of the circle.

We know that the x-coordinate of Point A is 8.

ג. Find the y-coordinate of Point A (the y-coordinate of Point A is greater than 12).

ד. **(1)** Find the equation of Line AO.

(2) Find the coordinates of Point C.

ה. Find the area of Triangle MCO.

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Differential and Integral Calculus

4. Consider function $f(x) = 10\sqrt{x} - 2x - 7$.

א. Find the domain [תחום ההגדרה] of function $f(x)$.

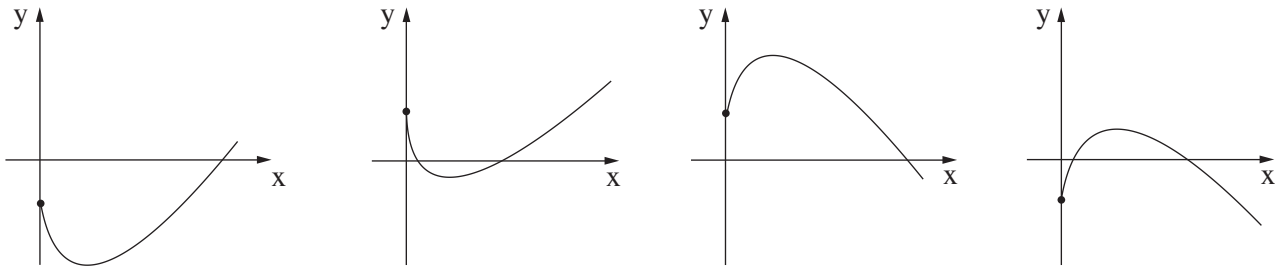
ב. Find the coordinates of the intersection point of the graph of function $f(x)$ with the y-axis.

ג. Find the coordinates of the local extremum [נקודת הקיצון הפנימית] of function $f(x)$, and determine what type of extremum it is.

ד. Determine which of the graphs 1–4 at the end of the question describes function $f(x)$.

ה. **(1)** How many intersection points does the line $y = 4$ have with the graph of function $f(x)$? Explain your answer.

(2) For what values of k does the line $y = k$ not intersect the graph of function $f(x)$?

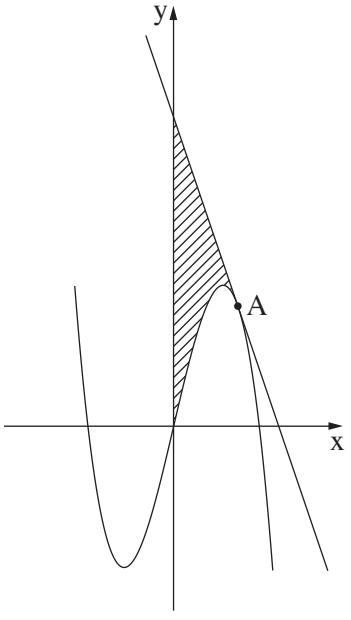


5. The figure to the right shows the graph of function $f(x) = -x^3 + 16x$.
A tangent to the graph of function $f(x)$ was drawn through Point A .
We know that the x-coordinate of Point A is 3 .

א. **(1)** Find the slope of the tangent.

(2) Find the equation of the tangent.

ב. Calculate the area of the shaded region in the figure:
the region bounded by the graph of function $f(x)$, the tangent, and the y-axis.



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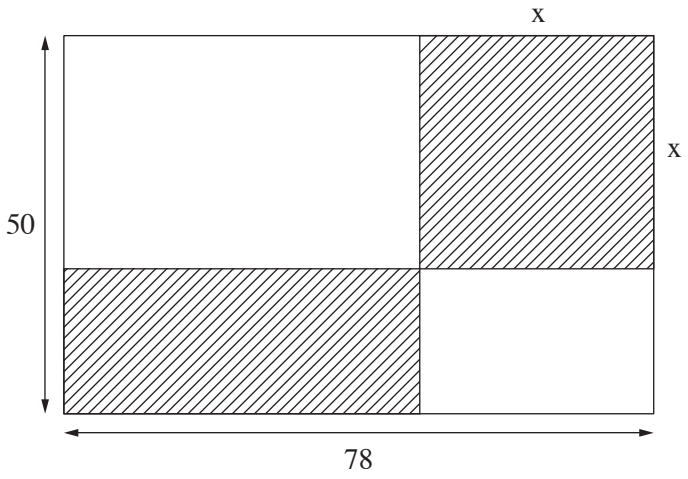
6. Consider a rectangle in which the length of one side is 50 and the length of the other side is 78 .
The rectangle has been divided into four areas: two are shaded and two are white.
One of the shaded areas is square and the other is rectangular, as shown in the figure below.
Let x denote the side length of the square.

א. Express the lengths of the sides of the shaded rectangle in terms of x .

ב. Find the value of x for which the sum of the shaded areas is minimum (smallest).

ג. For the value of x that you found in Item ב, find the sum of the white areas.



Good Luck!

בהצלחה!