The State of Israel
Ministry of Education
Exam Type: *Bagrut*
Exam Date: Summer 2026
Exam Number: 35472
Appendix: Formula sheets for 4 points
English Translation (3)

מדינת ישראל
משרד החינוך
סוג הבחינה: בגרות
מועד הבחינה: קיץ תשפ"ו, 2026
מספר השאלון: 35472
נספח: דפי נוסחאות ל־4 יחידות לימוד
תרגום לאנגלית (3)

תוכנית חדשה

Mathematics
4 Points – 2nd Exam

מתמטיקה
4 יחידות לימוד – שאלון שני

Instructions

א. Duration of exam: Two hours.

ב. Exam structure and breakdown of points:
This exam has two parts, with a total of five questions.
Part One – Sequences, Spatial Geometry, and Growth and Decay
Part Two – Differential and Integral Calculus of Exponential and Logarithmic Functions

Answer three questions, at least one from each part – $3 \times 33\frac{1}{3} = 100$ points.

ג. Material that may be used during the exam:
(1) A non-graphing calculator. Do 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 question 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 the disqualification of your exam.

Write only in the answer booklet. Write "טיוטה" at the top of each draft page.
If you use any draft paper outside the answer booklet, your exam may be disqualified.

Good Luck!

הוראות

א. משך הבחינה: שעתיים.

ב. מבנה השאלון ומפתח ההערכה:
בשאלון זה שני פרקים, ובהם חמש שאלות.
פרק ראשון – סדרות, גאומטרייה במרחב וגדילה ודעיכה
פרק שני – חשבון דיפרנציאלי ואינטגרלי של פונקציות מעריכיות ולוגריתמיות

יש לענות על שלוש שאלות, על שאלה אחת לפחות מכל פרק – $3 \times 33\frac{1}{3} = 100$ נקודות.

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!

(Continued on page 2)

Questions

Answer three of the questions 1–5, at least one question from each part (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.

Part One – Sequences, Spatial Geometry, and Growth and Decay

1. An ice-cream shop began making chocolate ice-cream for the summer vacation.
Every day, they made 3 kg more chocolate ice-cream than the previous day.
The amount of chocolate ice-cream made on the first and fourth day was 149 kg in total.

א. Find how many kilograms of chocolate ice-cream the shop made on the first day.

The shop made chocolate ice-cream over a period of 16 days.

ב. Find how many kilograms of chocolate ice-cream the shop made in total.

The shop also made vanilla ice-cream for the summer vacation.
Every day, the shop made d kg more vanilla ice-cream than the previous day.
The shop made vanilla ice-cream over a period of 16 days. On the last day, the shop made 115 kg of vanilla ice-cream.
The total amount of vanilla ice-cream the shop made was 480 kg less than the total amount of chocolate ice-cream it made.

ג. Find the value of d .

When the shop finished making the chocolate and vanilla ice-cream, it started selling both flavors of ice-cream.
In 5 days, the shop sold all the ice-cream it had made.
Every day, the shop sold 2 times the amount of ice-cream it had sold the previous day.

ד. Find how many kilograms of ice-cream the shop sold on the first day.

(Continued on page 3)

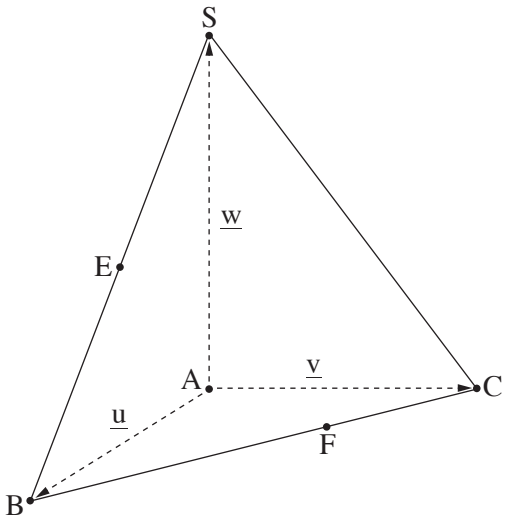
2. The figure to the right shows Pyramid ABCS .

Edge AS is perpendicular to the plane of Base ABC .

Point E is the midpoint of Edge BS .

Point F is located on Edge BC such that $\overrightarrow{BF} = \frac{2}{3}\overrightarrow{BC}$.

Let $\overrightarrow{AB} = \underline{u}$, $\overrightarrow{AC} = \underline{v}$, $\overrightarrow{AS} = \underline{w}$.



א. Express the following vectors in terms of $\underline{u}$, $\underline{v}$ and $\underline{w}$:
$\overrightarrow{BC}$, $\overrightarrow{BS}$, $\overrightarrow{AE}$, $\overrightarrow{AF}$.

We know that $|\underline{w}| = 8$, $|\underline{u}| = |\underline{v}| = 6$, $\sphericalangle BAC = 120^o$.

ב. Calculate the volume of the pyramid.

ג. **(1)** Find the value of $\underline{u} \cdot \underline{v}$.

(2) Prove that $\overrightarrow{AE}$ is perpendicular to $\overrightarrow{AF}$.

ד. **(1)** Find the value of $|\overrightarrow{AF}|$.

(2) Calculate the area of Triangle EAF .

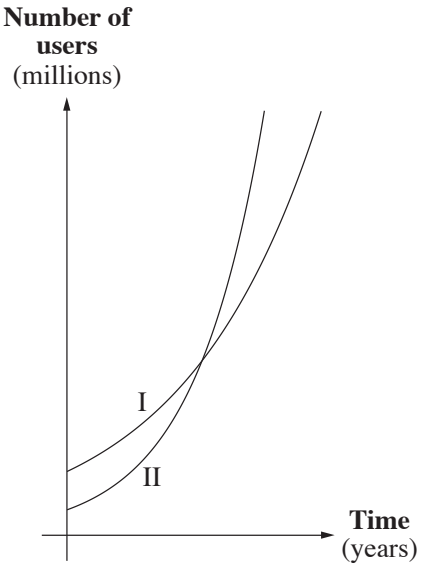
(Continued on page 4)

3. At the beginning of 2025, researchers investigated the numbers of users of two artificial intelligence (AI) tools, Tool A and Tool B.

The researchers expected the number of Tool A users to increase by 10% every year.

We know that at the beginning of 2025, there were 50 million users of Tool A.

א. Find the expected number of Tool A users at the beginning of 2030.



The researchers expected the number of Tool B users to increase by a fixed percentage every year.

The number of Tool B users at the beginning of 2031 is expected to be 3 times greater than the number of Tool B users at the beginning of 2025.

ב. Find by what percentage the number of Tool B users is expected to increase every year.

The two graphs, I–II, above, describe the number of people expected to the use Tools A and B from the beginning of 2025 onwards.

ג. Which graph, I or II, describes the number of people expected to use Tool B?
Explain your answer.

The researchers expect that there will be 30 million more users of Tool A than of Tool B at the beginning of 2030.

ד. Find how many Tool B users there were at the beginning of 2025.

ה. How long after the beginning of 2025 is the number of Tool A users expected to equal the number of Tool B users?

(Continued on page 5)

Part Two – Differential and Integral Calculus of Exponential and Logarithmic Functions

4. Consider function $f(x) = (a - 4x) \cdot e^{2x-1}$, defined for all x .

a is a parameter.

We know that the slope of the tangent to the graph of function $f(x)$ at the point where $x = 0$ is $\frac{16}{e}$.

א. Find the value of a .

Substitute $a = 10$ in function $f(x)$, and answer Items ב–ו.

ב. **(1)** Find the coordinates of the intersection points of the graph of function $f(x)$ with the axes.

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

ג. Sketch a graph of function $f(x)$.

Consider function $g(x) = 4 \cdot e^{2x-1}$, defined for all x .

ד. Explain why function $g(x)$ is positive for all x .

Point A is the intersection point of the graph of function $f(x)$ with the graph of function $g(x)$.

ה. Find the coordinates of Point A .

A perpendicular to the x-axis is dropped through Point A .

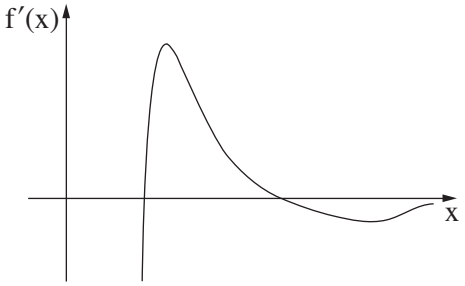
ו. Calculate the area bounded by the graph of function $g(x)$, the perpendicular, the x-axis, and the y-axis.

(Continued on page 6)

5. Consider function $f(x)$ and its derivative function $f'(x)$, both defined on the domain $x > 0$.

The figure on the right describes the graph of the derivative function $f'(x)$.

The figure shows all the extrema [נקודות קיצון] of the derivative function $f'(x)$ and all its intersection points with the x-axis.



א. Consider Statements I and II, below.

Determine whether <u>each</u> of these statements is true or false. Explain your answers.

I Function $f(x)$ has exactly three extrema.

II The x-coordinate of the minimum of function $f(x)$ is greater than the x-coordinate of its maximum.

We know that $f(x) = \frac{14(\ell nx)^2}{x^2}$.

ב. **(1)** Find the coordinates of the intersection points of the graph of function $f(x)$ with the axes (if there are any).

(2) Find the coordinates of the extrema of function $f(x)$, and determine what type of extrema they are.

(3) Find the intervals on which function $f(x)$ is increasing and decreasing.

ג. Sketch a graph of function $f(x)$.

Consider function $g(x) = f(x-4)$.

ד. **(1)** What is the domain of function $g(x)$?

(2) Find the coordinates of the extrema of function $g(x)$, and determine what type of extrema they are.

Good Luck!

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בהצלחה!

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