

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

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

Mathematics

3 Points – 3rd Exam

מתמטיקה

3 יחידות לימוד – שאלון שלישי

Instructions

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

הוראות

א. משך הבחינה: שעתיים וחצי.

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.

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. 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.

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. 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.

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.

Write in the answer booklet only. Write "טייטה" 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.

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

Good Luck!

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 fabric store sells two types of fabric: silk and cotton.

The price of a meter of cotton fabric is 14 shekels less than the price of a meter of silk fabric.

Maya bought 12 meters of cotton fabric and 8 meters of silk fabric.

Let x denote the price of a meter of silk fabric.

- א. Express in terms of x the total sum that Maya paid for the fabrics she bought.

At the same store, Eden bought 20 meters of silk fabric and was given a 16% discount on the original price.

The total sum that Eden paid for the silk fabric she bought was equal to the total sum that Maya paid for the fabrics she bought.

- ב. Find x .

Eden used the fabric she bought to sew 14 shirts. The shirts were all the same size.

She needed 1.3 meters of fabric to sew one shirt.

- ג. What percentage of the fabric that Eden bought was left over after she had finished sewing the shirts?

2. In Quadrilateral ADEB, Vertex A is located on the x-axis.

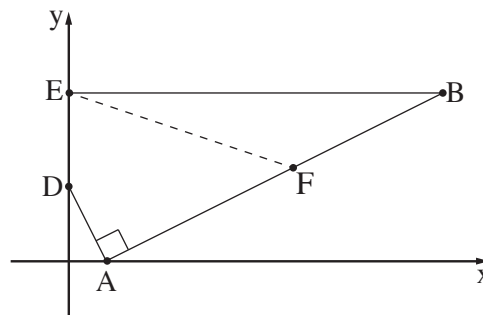
Vertex D and Vertex E are located on the y-axis,
as shown in the figure.

Side AD is perpendicular to Side AB.

We know that the equation of Line AD is $y = -2x + 4$.

א. Find the coordinates of Vertex A and Vertex D.

ב. Find the equation of Line AB.



Side BE is parallel to the x-axis.

Given: $E(0, 9)$.

ג. Find the coordinates of Vertex B.

A line with a slope of $-\frac{1}{3}$ (minus one third) was drawn through Vertex E. This line intersects Side AB at Point F (the dashed line in the figure).

ד. (1) Find the equation of Line EF.

(2) Find the coordinates of Point F.

ה. Calculate the area of Triangle EBF.

3. The figure to the right shows a circle whose center is $M(9, 2)$.

Point A is located on the circle.

Given: $A(6, 6)$.

א. (1) Find the length of the radius of the circle.

(2) Find the equation of the circle.

Point D is located on the circle, such that AD is parallel to the y-axis.

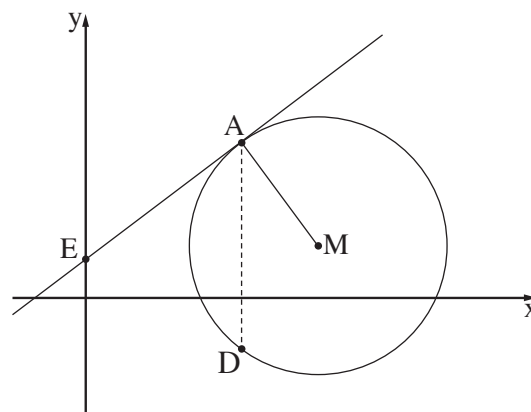
ב. Find the coordinates of Point D.

A tangent to the circle was drawn through Point A, intersecting the y-axis at Point E.

ג. (1) Find the slope of Line AM.

(2) Find the equation of the tangent.

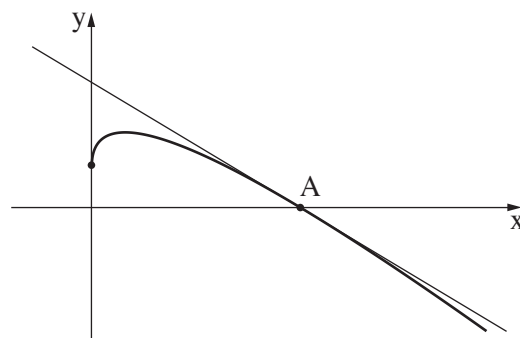
ד. Find the perimeter of Triangle EAD.



Differential and Integral Calculus

4. The figure to the right shows the graph of function $f(x) = 4\sqrt{x} - x + 5$.

- א. Give 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 maximum of function $f(x)$.



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

- ד. (1) What are the coordinates of Point A? Choose one of the three options below.
Explain your answer.
(9, 0) (4, 0) (25, 0)
- (2) Find the equation of the tangent to the graph of function $f(x)$ at Point A.

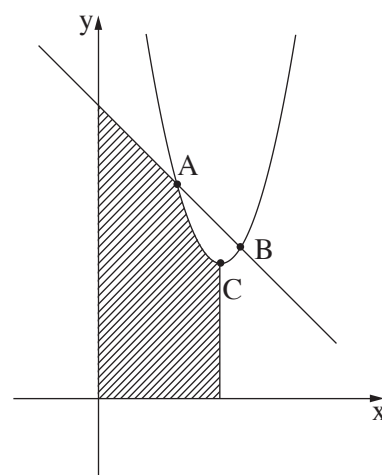
5. The figure to the right shows the graph of function $f(x) = x^2 - 10x + 31$ and the line $y = -x + 13$.

Point C is the extremum [נקודת הקיצון] of function $f(x)$.
Function $f(x)$ and the line intersect at Points A and B, as shown in the figure.

- א. Find the coordinates of Point A and Point B.
- ב. Find the coordinates of Point C.

A perpendicular was dropped from Point C to the x-axis.

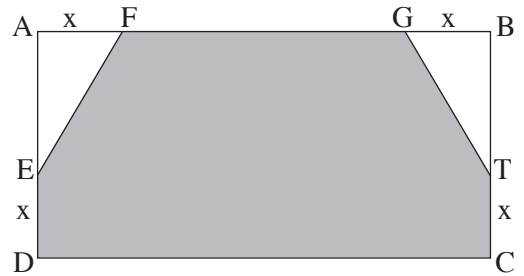
- ג. Find the area of the shaded region in the figure:
the region bounded by the graph of function $f(x)$, the line, the perpendicular, the x-axis, and the y-axis.



6. In Rectangle $ABCD$, Point E is located on Side AD ,
Point T is located on Side BC , and
Points F and G are located on Side AB ,
as shown in the figure.

We know that: $AB = 40$, $AD = 20$,

$$DE = AF = GB = TC = x.$$



- א. Express the sum of the areas of Triangles AFE
and BGT (the white regions in the figure) in
terms of x .
- ב. Find the value of x for which the area of Polygon $DEFGTC$ (the shaded region in the figure)
is minimum (smallest).