

Mathematics

3 Points – 3rd Exam

מתמטיקה

3 יחידות לימוד – שאלון שלישי

Instructions

א. Duration of the exam: Two 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
25 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 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 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 in the answer booklet only. Write "טיוטה" at the top of every page you use for draft.
If you write draft material outside the answer booklet, your exam may be disqualified.

הוראות

א. משך הבחינה: שתיים.

ב. מבנה השאלון ומפתח ההערכה:
בשאלון זה שש שאלות בנושאים:
אלגברה, חשבון דיפרנציאלי ואינטגרלי.
יש לענות על ארבע שאלות – לכל שאלה 25 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.

Good Luck!

בהצלחה!

Questions

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

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

Algebra

1. In a coffee shop, the price of one pastry and 5 bottles of drink comes to a total of 80 shekels.

The price of 6 pastries and 10 bottles of drink comes to a total of 288 shekels.

א. (1) Find the price of one pastry.

(2) Find the price of one bottle of drink.

The coffee shop announced a special offer: 20% discount off the price of a pastry

(with no change in the price of a bottle of drink).

While this special offer was on, the Levy family ordered a certain number of pastries and

7 bottles of drink.

The price of the Levy family's order came to a total of 374.4 shekels.

א. How many pastries did the Levy family order?

The Levy family paid a total of 420 shekels, including a tip for the waiter.

א. What percentage of the price of the Levy family's order was the tip?

2. In Quadrilateral ABCD, Vertex C is located on the x-axis and Vertex B is located on the y-axis.

AC is perpendicular to BC (see figure).

The equation of Line AC is $y = 4x - 32$.

א. Find the coordinates of Vertex C.

ב. Find the equation of Line BC.

The equation of Line AD is $y = -2x + 40$.

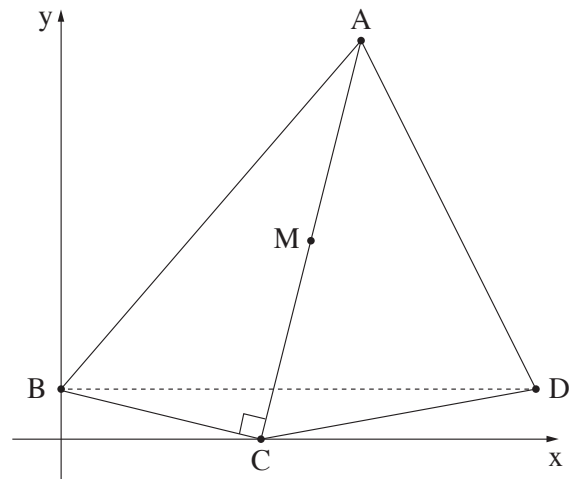
ג. Find the coordinates of Vertex A.

Line BD is parallel to the x-axis.

ד. Find the coordinates of Vertices B and D.

Point M is the midpoint of Segment AC.

ה. Calculate the area of Triangle BMD.



3. Consider the circle whose equation is $(x - 7)^2 + (y - 6)^2 = 25$.

Point M is the center of the circle.

Point A is located on the circle, as shown in the figure.

א. Write the coordinates of Point M.

The x-coordinate of Point A is 4.

ב. Find the y-coordinate of Point A
(the y-coordinate of Point A is greater than 6).

Point B is located on the extension of Segment MA.

We know that Point A is the midpoint of Segment MB.

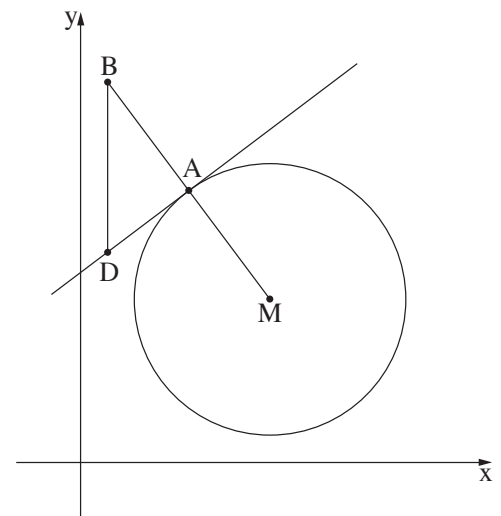
ג. Find the coordinates of Point B.

A tangent to the circle is drawn through Point A.

- ד. (1) Find the slope of MA.
(2) Find the equation of the tangent.

A line parallel to the y-axis is drawn from Point B, intersecting the tangent at Point D.

ה. Find the perimeter of Triangle BDA.



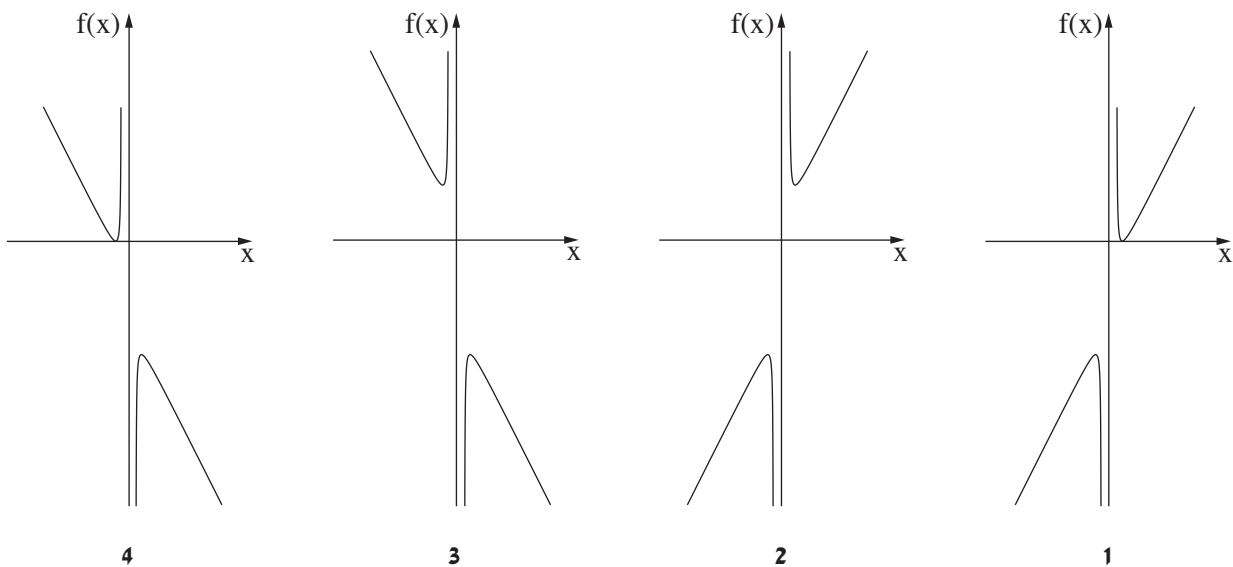
Differential and Integral Calculus

4. Consider the given function $f(x) = 2x + \frac{8}{x} - 8$.

- א. Find the domain [תחום ההגדרה] of function $f(x)$.
- ב. Find the coordinates of the extrema [נקודות הקיצון] of the function, and determine what type of extrema they are.
- ג. Determine which of the graphs 1-4 shown at the end of the question describes the graph of function $f(x)$.

A tangent to the graph of function $f(x)$ is drawn through a point where $x = 1$ and another tangent is drawn through a point where $x = -1$.

- ד. Consider the two statements (1) and (2) below. Determine whether each statement is correct or incorrect and explain your answer.
 - (1) At the point where $x = 1$, the slope of the tangent is -6 .
 - (2) These two tangents are parallel.

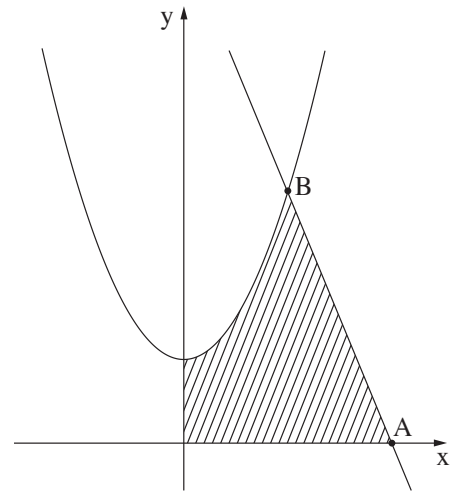


5. Consider the given function $f(x) = x^2 + 2$,
and the line whose equation is $y = -3x + 12$.

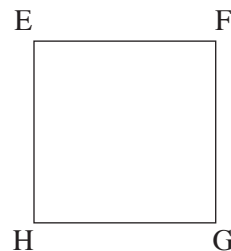
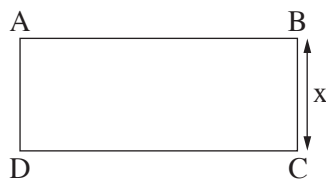
The line intersects the x-axis at Point A.

Point B, which is located in the first quadrant, is one of the intersection points of function $f(x)$ with the line, as shown in the figure.

- א. Find the coordinates of Point A.
- ב. Find the coordinates of Point B.
- ג. Calculate the area of the shaded region in the figure:
the area bounded by the graph of function $f(x)$, the line,
the x-axis, and the y-axis.



6. The figures below show a rectangle ABCD and a square EFGH.



Let x denote the length of Side BC.

We know that the length of Side DC is greater by 3 than the length of Side BC.

- א. (1) Express the length of Side DC in terms of x .
- (2) Express the area of Rectangle ABCD in terms of x .

The sum of the lengths of Sides BC and EH equals 12.

- ב. Consider the three expressions below.

Choose the expression which corresponds to the length of a side of Square EFGH.

1. $x + 12$
 2. $x - 12$
 3. $12 - x$
- ג. Find the value of x for which the sum of the areas of the rectangle and the square is minimum.

Good Luck!

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בהצלחה!

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