

Mathematics

3 Points — 3rd Exam

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, Differential and Integral Calculus.

You must answer four questions — $4 \times 25 = 100$ 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 disqualification of your exam.

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

מתמטיקה

3 יחידות לימוד — שאלון שלישי

הוראות לנבחן

א. משך הבחינה: שעותיים.

ב. מבנה השאלון ומפתח ההערכה:

בשאלון זה שש שאלות בנושאים:

אלגברה, חשבון דיפרנציאלי ואינטגרלי.

עליך לענות על ארבע שאלות — $4 \times 25 = 100$ 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.

כתוב במחברת הבחינה בלבד. רשום "טיטה" בראש כל עמוד המשמש טיטה.

כתיבת טיטה בדפים שאינם במחברת הבחינה עלולה לגרום לפסילת הבחינה.

Good Luck!

בהצלחה!

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. The price of a candy bar in a certain store is x shekels. The price of a snack in the same store is 1.5 shekels higher than the price of the candy bar.

The store packs the candy bars and snacks in red bags and yellow bags.

- A red bag contains 2 snacks and 2 candy bars.
- A yellow bag contains 3 snacks and one candy bar.

- א. (1) Express the total price of the products in a red bag in terms of x .
- (2) Express the total price of the products in a yellow bag in terms of x .

Given: The total price of the products in 43 red bags is equal to the total price of the products in 38 yellow bags.

- א. Find the price of a candy bar and the price of a snack.
- א. (1) What is the total price of the products in a yellow bag?
- (2) By what percentage is the total price of the products in a red bag lower than the total price of the products in a yellow bag?
- Your answer should be accurate to 2 decimal places.

2. Quadrilateral ABCD ($AB \parallel DC$) is a right trapezoid.

$\angle ABC = \angle BCD = 90^\circ$, as shown in the figure to the right.

The bases of the trapezoid are located along the lines:

(i) $y = \frac{1}{2}x - 2$; (ii) $y = \frac{1}{2}x + 3$.

א. Which of the two line equations corresponds to Base AB, and which corresponds to Base DC?

Given: B (8,7)

א. (1) Find the equation of Side BC.

(2) Find the coordinates of Vertex C.

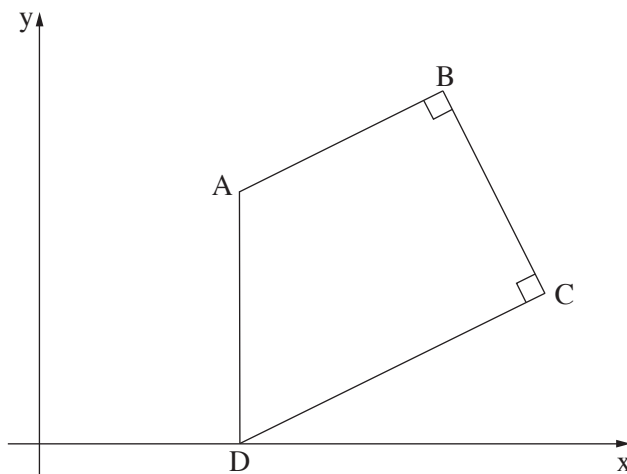
Given: Vertex D is located on the x-axis.

Side AD is perpendicular to the x-axis.

א. (1) Find the coordinates of Vertex D.

(2) Find the coordinates of Vertex A.

ב. Show that Triangle ABC is an isosceles triangle.



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

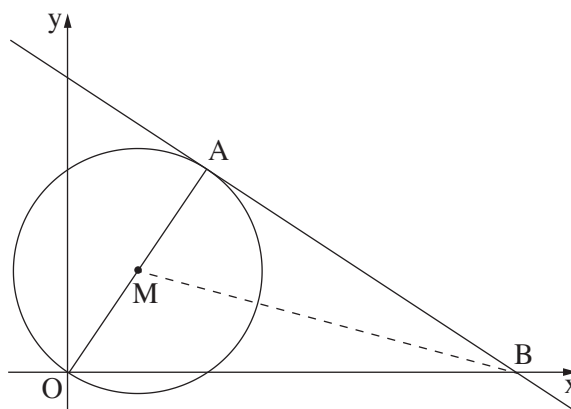
The circle passes through the origin, O.

א. Find the equation of the circle.

Given: OA is a diameter of the circle.

א. Find the coordinates of Point A.

ב. Find the equation of the line that is tangent to the circle at Point A.



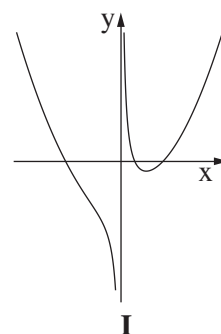
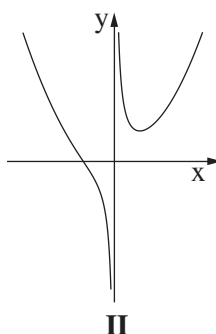
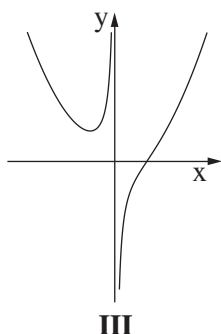
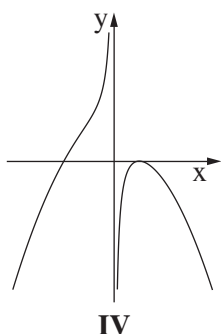
The line whose equation you found for Item א intersects the x-axis at Point B.

ב. Calculate the area of Triangle ABM.

Differential and Integral Calculus

4. Given: function $f(x) = \frac{5}{x} + 0.16x^2$.

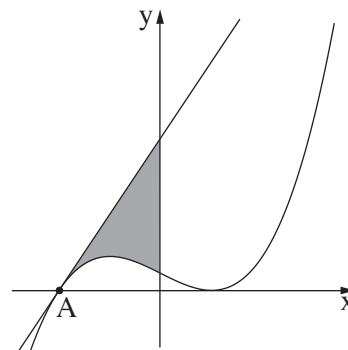
- א. Find the domain [תחום ההגדרה] of the function.
- ב. Find the asymptote of the function that is perpendicular to the x-axis.
- ג. Find the coordinates of the extremum [נקודת קיצון] of the function, and determine what type of extremum it is.
- ד. Which of the graphs I-IV at the end of the question describes the graph of function $f(x)$? Explain your answer.
- ה. How many points of intersection does the graph of function $f(x)$ have with the line $y = 5$? Explain your answer.



5. The figure to the right describes the graph of the function $f(x) = x^3 - 3x + 2$.

$A(-2, 0)$ is a point on the graph of the function $f(x)$.

- א. Find the equation of the line that is a tangent to the graph of the function $f(x)$ at Point A.
- ב. Find the area of the region in the second quadrant which is bounded by the graph of the function $f(x)$, the y-axis, and the line whose equation you found in Item א (the gray area in the figure).



6. The sum of three positive numbers is 15.

The second number is 3 times greater than the first number.

Let x denote the first number.

א. Express the second number and the third number in terms of x .

ב. (1) Find the value of x for which the product of the three numbers is maximal.

(2) Find the maximal product of the three numbers.

Good Luck!

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בהצלחה!

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