

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.

Each question is worth 30 points.

You may answer as many questions as you like but the maximum number of points you can earn is 100,

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 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 your answer booklet only. Write "טייטה" at the top of each draft page. If you write draft work outside your answer booklet, 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. לכל שאלה — 30 נקודות.

מוותר לך לענות על מספר שאלות כרצונך, אך סך הנקודות שתוכל לצבור 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) 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 "טייטה" בראש כל עמוד המשמש טיוטה. תביט טיוטה בדפים שאינם במחברת הבחינה עלולה לגרום לפסילת הבחינה.

Good Luck!

בהצלחה!

Questions

This exam has six questions. A complete answer is worth 30 points.

You may answer as many questions as you like, completely or partially, but the maximum number of points that you can earn is 100.

Note: Explain all of your work, including calculations, clearly and in detail.

Lack of detail may lower your score or lead to disqualification of your exam.

Algebra

1. The price of a blanket is 4 times higher than the price of a pillow.

In a special sale, the price of a blanket was reduced by 15% , and the price of a pillow was reduced by 20% .

Dana bought one blanket and 2 pillows in the sale. She paid a total of 370 shekels for her purchases.

- א. What was the price of a pillow before the sale? What was the price of a blanket before the sale?

Dana's budget would have enabled her to buy exactly one blanket and 2 pillows at the original prices (before the sale).

- ב. Will the amount of money that Dana saved by shopping at the sale be enough to buy 2 more pillows at the sale price? Explain.

2. In Triangle ABC , Side BC lies on the x-axis, as shown in the figure.

Given: $BC = 5$;

Vertex A is located at the point $(6, -4)$;

The equation of Side AB is $y = -\frac{4}{3}x + 4$.

- א. (1) Find the coordinates of Vertex B .
(2) Find the coordinates of Vertex C .

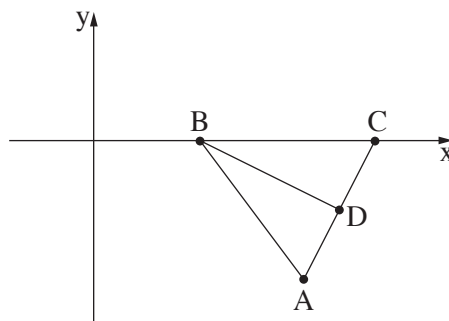
BD is a median in Triangle ABC .

- ב. Find the equation of Line BD .

- ג. Show that BD is perpendicular to AC .

- ד. Find the area of Triangle ABC .

- ה. How many times greater than the area of Triangle BCD is the area of Triangle ABC ?
Explain.



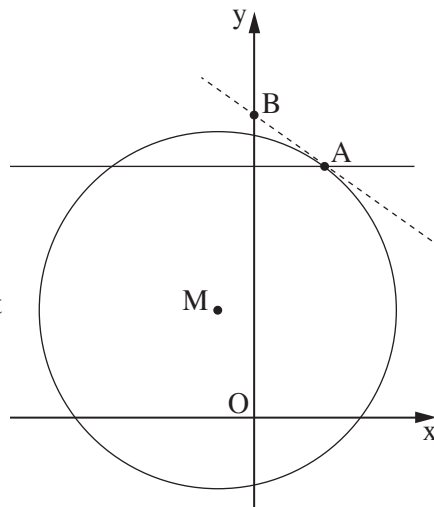
3. Point M is the center of the circle

$$(x + 1)^2 + (y - 3)^2 = 25 .$$

Line $y = 7$ intersects the circle at Point A (see figure).

We know that Point A is located in the first quadrant.

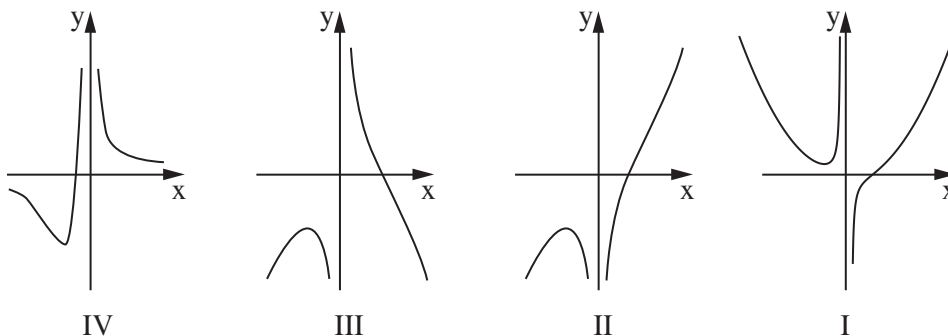
- א. Find the coordinates of Point A .
- ב. (1) Find the slope of Line MA .
(2) Find the equation of the tangent to the circle at Point A .
- ג. The tangent whose equation you found for Sub-item ב(2) intersects the y-axis at Point B .
Find the area of Triangle ABO (Point O is the origin).



Differential and Integral Calculus

4. Given: The function $f(x) = \frac{16}{x} - x^2 + 3$.

- א. Find the domain [תחום ההגדרה] of the function $f(x)$.
- ב. Find the coordinates of the extremum [נקודת הקיצון] of the function $f(x)$ and determine what type of extremum it is.
- ג. Determine whether the function $f(x)$ increases or decreases for $x > 0$. Explain.
- ד. One of the four graphs shown at the end of the question, I, II, III or IV, is the graph of the function $f(x)$. Which one is it? Explain.
- ה. Give an example of a line that is parallel to the x-axis and intersects the graph of the function $f(x)$ at three different points. Explain your answer.



5. The parabola $f(x) = -x^2 + 8x - 18$ and the line $y = -x - 10$ are shown in the figure below.

The parabola and the line intersect at Points A and B ,

as shown in the figure.

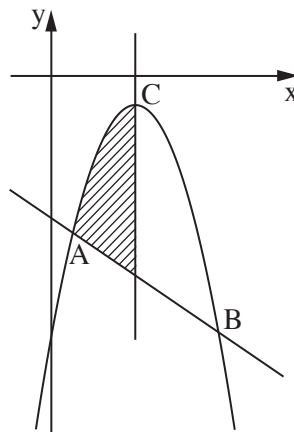
Point C is the maximum point of the parabola.

א. Find the coordinates of Point C .

ב. Find the coordinates of Points A and B .

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

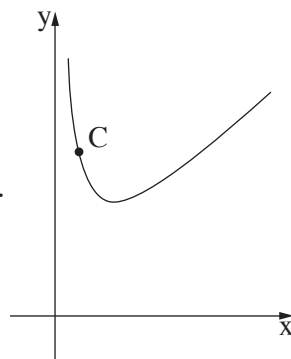
- ג. Calculate the area of the shaded region in the figure:
the area of the region which is to the left of the perpendicular,
and bounded by the parabola, the line, and the perpendicular.



6. Given: The function $y = 3x + \frac{1}{x}$ in the domain $x > 0$ (see figure).

C is a point on the graph of the function.

- א. Find the x-coordinate of Point C for which the sum of the coordinates of Point C is the smallest possible one [מינימלי].
ב. Find the smallest possible sum of the coordinates of Point C .



Good Luck!

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בהצלחה!

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