The State of Israel
Ministry of Education
Exam Type: *Bagrut*
Exam Date: Winter 2020
Exam Number: 035382
Appendix: Formula sheets for 3 points
English Translation (3)

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. 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 "טיוטה" at the top of each draft page. If you write draft work outside your answer booklet, your exam may be disqualified.

Good Luck!

מדינת ישראל
משרד החינוך
סוג הבחינה: בגרות
מועד הבחינה: חורף תש"ף, 2020
מספר השאלון: 035382
נספח: דפי נוסחאות ל־3 יחידות לימוד
תרגום לאנגלית (3)

מתמטיקה

3 יחידות לימוד — שאלון שלישי

הוראות לנבחן

א. משך הבחינה: שעתיים.

ב. מבנה השאלון ומפתח ההערכה:
בשאלון זה שש שאלות בנושאים:
אלגברה, חשבון דיפרנציאלי ואינטגרלי.
עליך לענות על ארבע שאלות — 4×25 = 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 "טיוטה" בראש כל עמוד המשמש טיוטה.
כתיבת טיוטה בדפים שאינם במחברת הבחינה עלולה לגרום לפסילת הבחינה.

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. On Sunday, Amir bought one falafel and one soft drink at the falafel store, and paid a total of 27 shekels.

On Monday, Amir returned to the same store and saw that a falafel was being sold that day at a 25% discount, although the price of a soft drink had not changed.

On Monday, he bought 3 falafel and one soft drink, and paid a total of 49.5 shekels.

א. Calculate the price of a falafel before the discount, and also the price of a soft drink.

On that same Sunday, Keren bought 9 falafel at the same store (without a discount) and 9 soft drinks. On Monday (when a discount was being given), Keren returned to the same store and again bought 9 falafel and 9 soft drinks.

ב. By what percentage is the sum that Keren paid on Monday lower than the sum that she paid on Sunday?

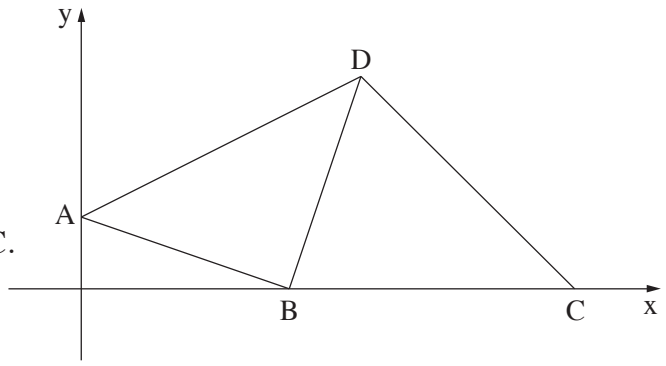
2. The figure to the right shows Triangles ABD and BCD.

Points B and C are located on the x-axis.

The equation of Line BD is $y = 3x - 18$;

the equation of Line DC is $y = -x + 14$.

D is the point of intersection of Lines BD and DC.



א. Find the coordinates of Points B and C.

ב. Find the coordinates of Point D.

Given: A(0 , 2) .

ג. Prove that Line AB is perpendicular to Line BD.

ד. **(1)** Calculate the area of Triangle ABD.

(2) Calculate the area of Quadrilateral ABCD.

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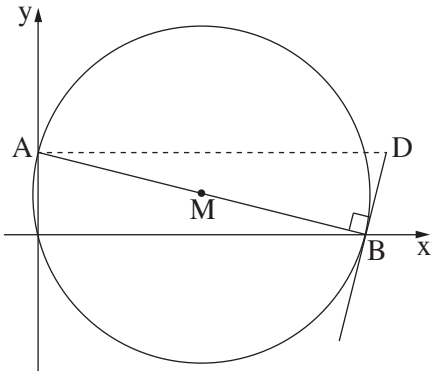
3. Segment AB is a diameter in a circle whose center is M (see figure).

Given: A(0 , 2) , B(8 , 0) .



א. **(1)** Find the coordinates of Point M.

(2) Find the equation of the circle.

ב. Find the slope of Line AB.

A tangent to the circle was drawn at Point B.

ג. Find the equation of this tangent.

Point D is located on the tangent, such that Line AD is parallel to the x-axis.

ד. **(1)** Find the coordinates of Point D.

(2) Calculate the perimeter of Triangle ABD.

You may leave root signs in your answer.

Differential and Integral Calculus

4. Given: the function $f(x) = 0.25x + \frac{9}{x}$.

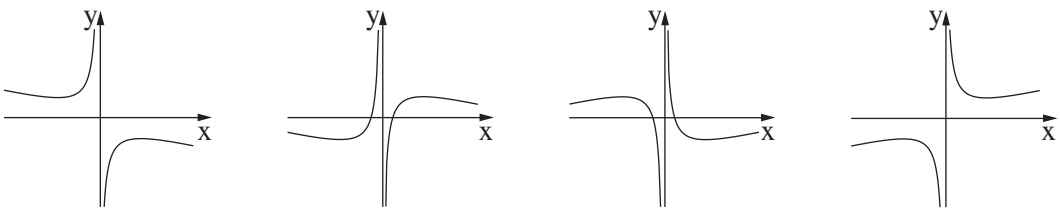
א. What is the domain [תחום ההגדרה] of the function f(x)?

ב. Find the coordinates of the extrema [נקודות הקיצון] of the function f(x), and determine what type of extrema they are.

ג. On what intervals is the function f(x) increasing?

ד. Does the graph of the function f(x) have points of intersection with the axes? Explain.

ה. Which of the four graphs below, I-IV, is the graph of the function f(x)? Explain.



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5. The figure to the right shows the graph of the function $f(x) = -2x^2 + 4x + 13$.

Point B is the extremum [נקודת הקיצון] of the function f(x).

א. Find the coordinates of Point B.

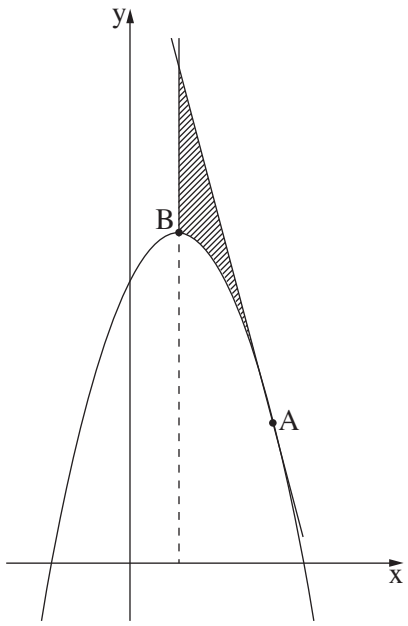
A tangent was drawn to the function f(x) through Point A, where x = 3 (see figure).

ב. **(1)** Find the slope of the tangent.

(2) Find the equation of the tangent.

A line parallel to the y-axis was drawn through Point B (see figure).

ג. Calculate the shaded area in the figure:
the area bounded by the graph of the function f(x), the tangent, and the line that is parallel to the y-axis.



6. Two numbers are given: $\sqrt{x}$ and $(-x)$.

א. Find the value of x for which the sum of the two given numbers is maximal.

ב. Find the sum of the two given numbers for the value of x that you found in Item א.

Good Luck!

בהצלחה!