EBA 29102
Mathematics for Business Analytics

Department of Economics

Start date:	11.12.2019	Time 09.00
Finish date:	11.12.2019	Time 12.00

Weight:	20% of EBA 2910
Total no. of pages:	7 incl. front page
Answer sheets:	Answer sheets for multiple-choice examinations
Examination support materials permitted:	BI-approved exam calculator. Simple calculator. Bilingual dictionary.

11 December 2019

The exam has 15 multiple choice problems. Correct answer gives 3 points, incorrect answer gives -1 points, answer (E) gives 0 points. Only one answer is correct.

Problem 1

The remainder of the polynomial division $(2x^3 - 5x + 3) : (x - 3)$ is

(A) 72
(B) 42
(C) 13
(D) 0
(E) I choose not to answer this problem.

Problem 2

Which statement is <u>not</u> correct?

(A) If $f(x) = e^x$ then $f'(-1) < 0.37$
(B) If $f(x) = \sqrt{x}$ then $f'(4) = 0.25$
(C) If $f(x) = \frac{x-1}{2x-3}$ then $f'(1) = -5$
(D) If $f(x) = x \ln(x)$ then $f'(1) = 1$
(E) I choose not to answer this problem.

Problem 3

The equation $(x^2 - 9)e^{0.1x} = 0$ has

(A) no solutions
(B) one solution
(C) two solutions
(D) three solutions
(E) I choose not to answer this problem.

Problem 4

In figure 1 you see the graph of $f(x)$.

Figure 1: The graph of $f(x)$

Which statement is <u>not</u> correct?

(A) $f(x)$ has three stationary points
(B) $f'(2) < f'(5)$
(C) $f'(x)$ is positive in the interval $[4.2 , 5.8]$
(D) $f'(x)$ er increasing in the interval $[0.2 , 1.2]$
(E) I choose not to answer this problem.

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Problem 5

We have the function $f(x) = -x^3 + 6x^2 - 9x + 10$ with domain of definition $D_f = [0, 4]$. Which statement is correct?

(A) $f(x)$ has two local minimum points.
(B) $f(x)$ has no global maximum.
(C) $f(x)$ has a local maximum which is less than 9.
(D) $f(x)$ has a global minimum point which is less than 1.
(E) I choose not to answer this problem.

Problem 6

Kåre considers a mortgage with monthly payments running for 30 years. He rekons he can afford to pay 12 000 each term. The first payment is 4 years from now. The interest is 3.6% with monthly compounding. Then Kåre can borrow

(A) $\quad \dfrac{12\,000}{1.036} + \dfrac{12\,000}{1.036^2} + \cdots + \dfrac{12\,000}{1.036^{29}} + \dfrac{12\,000}{1.036^{30}}$

(B) $\quad \dfrac{12\,000}{1.003^{48}} + \dfrac{12\,000}{1.003^{49}} + \cdots + \dfrac{12\,000}{1.003^{406}} + \dfrac{12\,000}{1.003^{407}}$

(C) $\quad \dfrac{12\,000}{1.003^{48}} + \dfrac{12\,000}{1.003^{49}} + \cdots + \dfrac{12\,000}{1.003^{407}} + \dfrac{12\,000}{1.003^{408}}$

(D) $\quad \dfrac{12\,000}{1.003^{49}} + \dfrac{12\,000}{1.003^{50}} + \cdots + \dfrac{12\,000}{1.003^{408}} + \dfrac{12\,000}{1.003^{409}}$

(E) I choose not to answer this problem.

Problem 7

Hege considers an investment of 30 million which is supposed to give a payment of 50 million 4 years from now. Suppose r is the internal rate of return for this cash flow with continuous compounding. Which statement is correct?

(A) $13.5\% < r < 13.6\%$

(B) $r = \sqrt[4]{\dfrac{5}{3}} - 1$

(C) $12.6\% < r < 12.7\%$

(D) $r = \dfrac{\ln(5) - \ln(3)}{4}$

(E) I choose not to answer this problem.

Problem 8

The inequality $\ln(x-1) \leqslant 2$ has the solutions

(A) x is a number in $[1, 1 + \ln(2)]$
(B) x is a number in $\langle 1, 1 + e^2]$
(C) x is a number in $[1 + e^2, \rightarrow\rangle$
(D) x is a number in $\langle \leftarrow, 1 + e^2]$
(E) I choose not to answer this problem.

Problem 9

We have a quadratic function $f(x)$ with graph as in figure 2.

Figure 2: The graph of the quadratic function $f(x)$

Which statement is correct?

(A) $f'(0) = 4$
(B) $f(1) = f(19)$
(C) $f''(9) = -0.5$
(D) $f(0) = 3.8$
(E) I choose not to answer this problem.

Problem 10

Which of these functions have a horizontal asymptote $y = a$ with a in the interval $[2, 5]$?

(A) $f(x) = \dfrac{2x + 1}{3x - 7}$

(B) $f(x) = \dfrac{\ln(3x^2 + 1)}{x}$

(C) $f(x) = \dfrac{x}{e^x + 1}$

(D) $f(x) = \dfrac{(1 - 3x)(4x + 1)}{(2x - 7)(1 - 2x)}$

(E) I choose not to answer this problem.

Problem 11

Let p be the price of a commodity and suppose $D(p) = 60 - 3p$ for $0 < p < 20$ is the demand function. Which statement is correct?

(A) If $10 < p < 20$ the demand is elastic.
(B) If $0 < p < 10$ the demand is elastic.
(C) If $0 < p < 20$ the demand is inelastic.
(D) The demand cannot be unit elastic.
(E) I choose not to answer this problem.

Problem 12

In figure 3 you see the graph of four different cost functions.
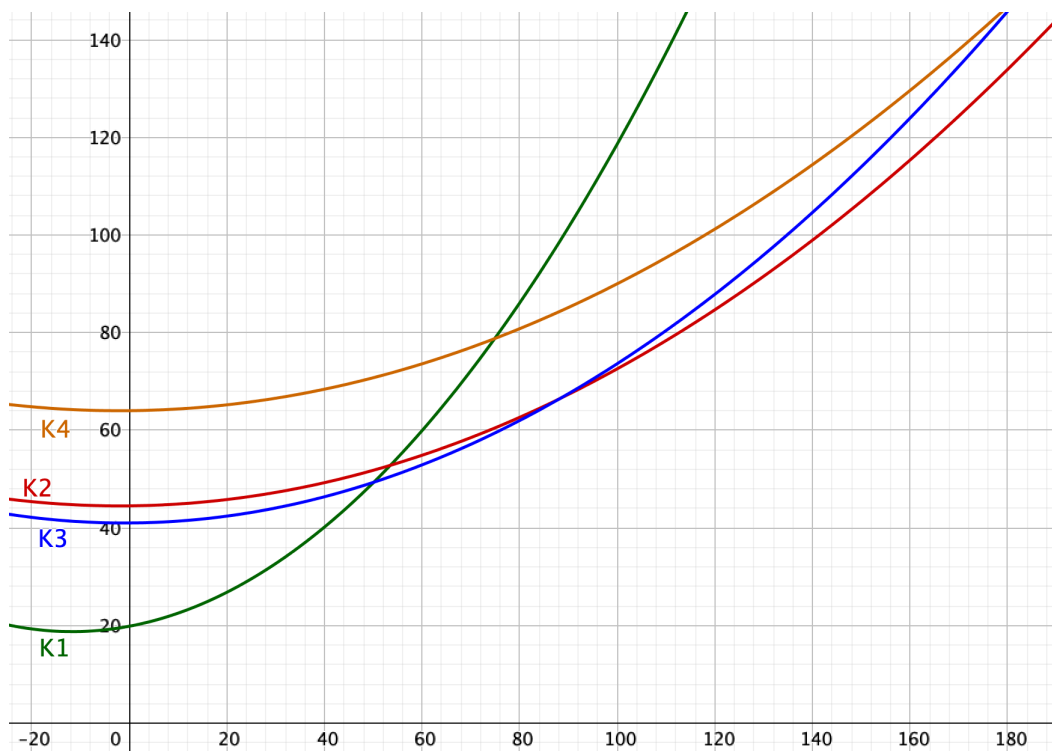
Figure 3: Four cost functions ($K_1 - K_4$)

Which statement is correct?

(A) K_1 has the smallest minimal average unit cost.
(B) K_2 has the smallest minimal average unit cost.
(C) K_3 has the smallest minimal average unit cost.
(D) K_4 has the smallest minimal average unit cost.
(E) I choose not to answer this problem.

Problem 13

We have the ellipse given by the equation $16x^2 + 9y^2 = 96x + 72y - 144$. Which statement is correct?

(A) The ellipse intersects the x-axis in two points.
(B) The centre of the ellipse is $(4, 3)$.
(C) The ellipse and the y-axis has no common points.
(D) The product of the semi-axes is greater than 10.
(E) I choose not to answer this problem.

Problem 14

We have a function $f(x)$ with derivative $f'(x)$ which has the following graph:
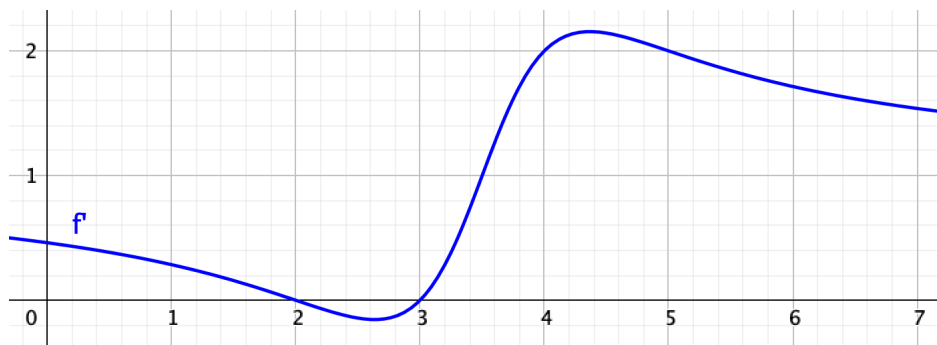
Figure 4: The graph of $f'(x)$

Which statement is correct?

(A) $f(x)$ has three inflection points.
(B) $f''(x)$ is strictly increasing in the interval $[3, 4]$.
(C) $f(2) > f(3)$.
(D) $f(x)$ is concave in the interval $[4, 5]$.
(E) I choose not to answer this problem.

Problem 15

We have a curve implicitly defined by the equation $e^{y^2+x} = 8x^2$. Which statement is correct?

(A) There are exactly two points on the curve with x-coordinate between 1 and 5 such that the slopes of the tangents at these points are 0.
(B) There is a point on the curve with x-coordinate larger than 5.5 such that the slope of the tangent at this point is negative.
(C) There is a point on the curve with x-coordinate between 0 og 0.4 such that the slope of the tangent at this point is negative.
(D) For all points on the curve with x-coordinate equal to 3 the slopes of the tangents at these points are negative.
(E) I choose not to answer this problem.

EXAMPLE

SVARARK TIL FLERVALGSEKSAMEN
ANSWER SHEET FOR MULTIPLE CHOICE EXAMINATION

Eksamenskode:
Examination code:

E B A 2 9 1 0 2

Initialer:
Personal initials:

NN

ID-nummer: (SKAL fylles ut!)
ID-number: (MUST be filled in!)

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5	☐	☐	☐	☐	☐	☒	☐	5
6	☐	☐	☐	☐	☐	☐	☒	6
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9	☐	☐	☐	☐	☐	☐	☐	9

Skriv tydelig
Fyll ut med ☒
Annuler kryss med ■
Helt fylt rute blir ikke registrert

Write clearly!
Record answer with ☒
Cancel a cross with ■
Compl. filled boxes will not be registered

Dette svararket leses kun av en maskin. Ikke noe av det du skriver utenom
de definerte feltene blir lest eller tatt hensyn til.
Ikke kluss på arket. Be heller om et nytt.

This answer sheet is only read by a machine. Answers or comments written
on the examination paper or outside the boxes will not be graded.
Do not scribble on this sheet.
Please ask for a new answer sheet if you need one.

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16	☐☐☐☐☐	36	☐☐☐☐☐	56	☐☐☐☐☐	76	☐☐☐☐☐	96	☐☐☐☐☐
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