EXAMINATION QUESTION PAPER - Take-home examination

EBA 29102
Mathematics for Business Analytics

Department of Economics

Start date:	10.12.2020	Time 14.00
Finish date:	10.12.2020	Time 17.00

Weight:	20% of EBA 2910
Total no. of pages:	4 incl. front page
No. of attachments files to question paper:	0
To be answered:	Individually

Answer paper size:	max 30 pages excl. attachments
Max no. of answer paper attachment files:	0
Allowed answer paper file types:	pdf

Home exam in EBA2910[1] - Mathematics for Business Analytics

10 December 2020

The exam has 12 problems of equal weight.

The answer paper must be written and prepared individually. Collaboration with others is not permitted and is considered cheating. All answer papers are automatically subject to plagiarism control. Students may also be called in for an oral consultation as additional verification of an answer paper.

Grades: A - F which counts for 20% of the final grade in the course.
You are required to give reasons for all answers. Refering to sequences of calculator button pushes, computer calculations, or similar, are not accepted as reasons. You should write by hand (or use a digital writing pad with your own handwriting) and your answer paper should be uploaded as one pdf-file. For more information, see:
https://portal.bi.no/en/examination/digital-examination/digital-submission/

Problem 1

Determine the remainder of the polynomial division $(6x^3 + 23x^2 + 19x + 14) : (x + 3)$.

Problem 2

Hege considers an investment of 25 million which is supposed to give a payment of 50 million 5 years from now. Determine the internal rate of return of this cash flow. We assume continuous compounding.

Problem 3

Let p be the price of a commodity with demand function $D(p) = 100e^{-0.2p}$. Determine which prices p which make the demand elasitic, inelastic and unit elastic.

Problem 4

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

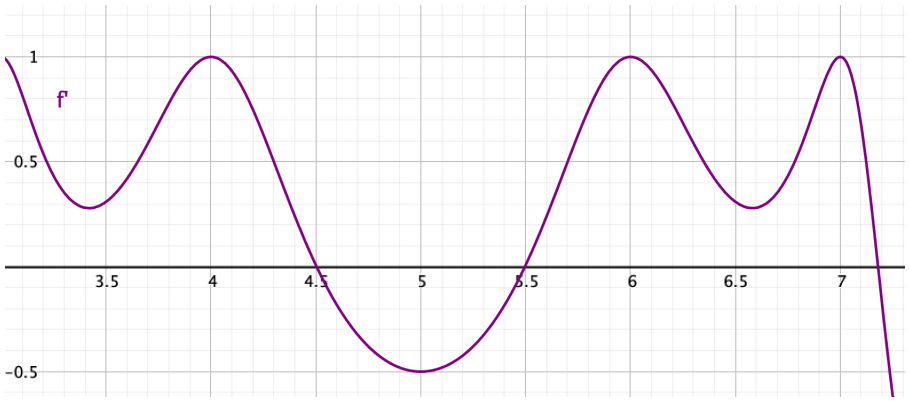

Figure 1: The graph of $f'(x)$

Which statements are correct? (it may be more than one)

(A) $f(x)$ has three stationary points
(B) $f(x)$ is convex in the interval $[5, 6]$
(C) $f(x)$ is convex in the interval $[4.5, 5.5]$
(D) $f(x)$ is increasing in the interval $[6, 7]$

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Problem 5

Solve the equation $(x^2-5)(e^x-2)\ln(x)=0$.

Problem 6

Describe a financial situation where the sum

$$5\,000\cdot 1.002^{120}+5\,000\cdot 1.002^{119}+\cdots+5\,000\cdot 1.002^2+5\,000\cdot 1.002$$

is relevant.

Problem 7

We have the function $f(x)=\ln(x-1)$ with domain of definition $D_f=[2,\rightarrow\rangle$. Determine the expression $g(x)$ for the inverse function and its domain of definition D_g.

Problem 8

A hyperbola function $f(x)$ has vertical asymptote $x=5$ and horizontal asymptote $y=100$. Moreover, $f(6)=112$. Compute $f(17)$.

Problem 9

We have the function $f(x)$ which is the composition of the two functions $u(x)$ and $g(x)$, which means that $f(x)=g(u(x))$. Compute $f'(12)$.

We know some of the function values:

x	1	2	12
$u(x)$	12	−30	52

x	1	12	52
$g(x)$	50	45	32

x	1	12	45
$u'(x)$	−0.2	−0.1	10

x	12	45	52
$g'(x)$	6	75	32

Problem 10

The function $f(x)$ has $f(30)=700$, $f'(30)=5$ and $f''(30)=-1$. Compute an approximate value for $f(31)$.

Problem 11

In figure 2 you see the graph of a cost function.

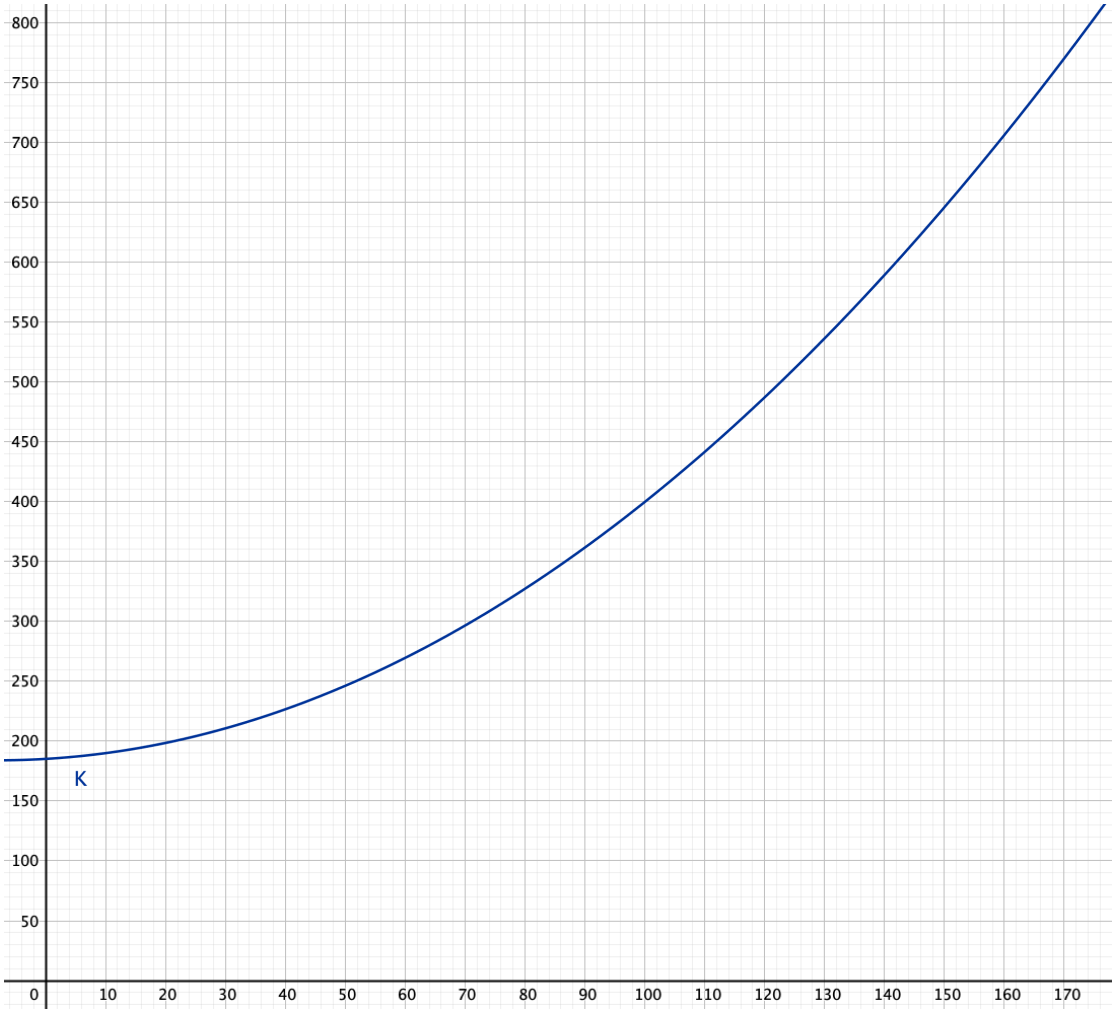

Figure 2: The cost function $K(x)$

Use the graph to determine approximate values for the cost optimum and the minimal unit cost. Explain why the method you use gives the answers.

Problem 12

An ellipse has centre $(3\,,4)$, the horizontal semi-axis is $\sqrt{3}$ and the vertical semi-axis is $\sqrt{6}$. Determine the function expressions for the tangents of the ellipse with $x = 2$.