

Multiple choice exam EBA29102 - Mathematics for Business Analytics

10 May 2022

The exam has 15 multiple choice problems. Right answer gives 3 points, wrong answer gives -1 points, answer (E) gives 0 points. Only one answer is right.

Problem 1

Which statement is correct?

- (A) The equation $xe^x = 0$ has no solutions
- (B) The equation $e^x = 1$ has no solutions
- (C) The equation $\ln(x - 1) = 0$ has no solutions
- (D) The equation $x^2 + 2x + 2 = 0$ has no solutions
- (E) I choose not to answer this problem.

Problem 2

Which statement is not correct?

- (A) If $f(x) = x\sqrt{x}$ then $f'(4) = 3$
- (B) If $f(x) = \frac{\ln(x)}{x+1}$ then $f'(1) = 0.5$
- (C) If $f(x) = xe^x$ then the equation $f'(x) = 0$ has no solutions
- (D) If $f(x) = \frac{x}{x^2+1}$ then $f'(\sqrt{2}) = -\frac{1}{9}$
- (E) I choose not to answer this problem.

Problem 3

You deposit 500 000 into an account with continuous compounding and interest r . After 8 years the balance is S . Which statement is correct?

- (A) $r = 2.1\%$ and $S = 590\,440$
- (B) $r = 1.7\%$ and $S < 572\,500$
- (C) $r = 1.9\%$ and $S = 582\,080$
- (D) $r = 1.6\%$ and $S > 568\,280$
- (E) I choose not to answer this problem.

Problem 4

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

- (A) $f(x)$ has two 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 which is less than 1.
- (E) I choose not to answer this problem.

Problem 5

Kåre considers a mortgage with monthly payments over 25 years. He reckons he can pay 9 000 every term. The first payment is 3 years from now. The interest is 2.4% with monthly compounding. Kåre is then able to borrow

- (A) $\frac{9000}{1.002^{335}} \cdot \frac{1.002^{300} - 1}{0.002}$ (E) I choose not to answer this problem.
- (B) $\frac{9000}{1.002^{300}} \cdot \frac{1.002^{300} - 1}{0.002}$
- (C) $\frac{9000}{1.002^{335}} \cdot \frac{1 - \left(\frac{1}{1.002}\right)^{300}}{\left(1 - \frac{1}{1.002}\right)}$
- (D) $\frac{9000}{1.002^{36}} \cdot \frac{1 - \left(\frac{1}{1.002}\right)^{335}}{\left(1 - \frac{1}{1.002}\right)}$

Problem 6

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

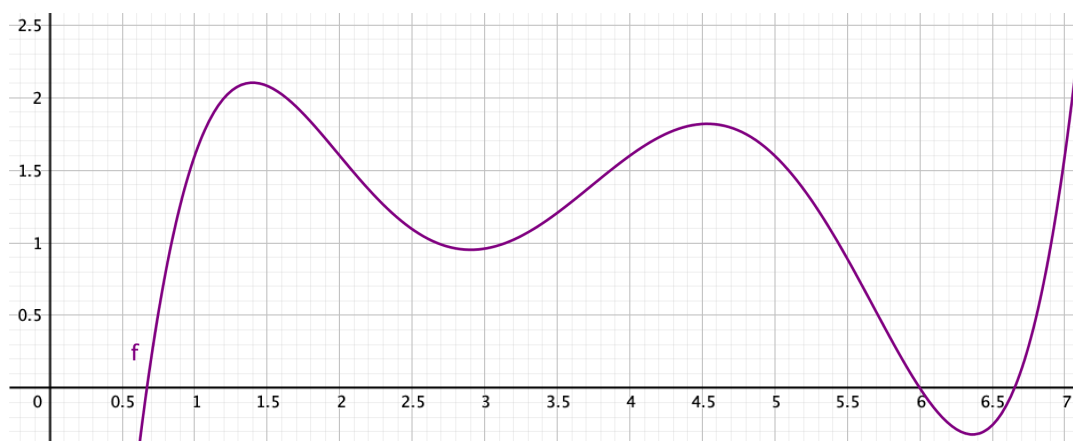


Figure 1: The graph of $f(x)$

Which statement is not correct?

- (A) $f(1) > f(3)$
- (B) $f'(2) < f'(4)$
- (C) $f'(x)$ is decreasing in the interval $[4, 5]$
- (D) $f''(x)$ equals zero at four points
- (E) I choose not to answer this problem.

Problem 7

The inequality $\frac{x+5}{x-3} < x$ has the solutions

- (A) $-1 < x < 5$
- (B) $-1 < x < 3$ or $x > 5$
- (C) $x < -1$ or $x > 5$
- (D) $-5 < x < 3$
- (E) I choose not to answer this problem.

Problem 8

Let p be the price for a commodity and suppose $D(p) = 180 - 5p$ with $0 < p < 36$ is the demand function. Which statement is correct?

- (A) If $11 < p < 19$ the demand is elastic.
- (B) If $21 < p < 25$ the demand is inelastic.
- (C) If $0 < p < 10$ the demand is inelastic.
- (D) The demand cannot be unit elastic.
- (E) I choose not to answer this problem.

Problem 9

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

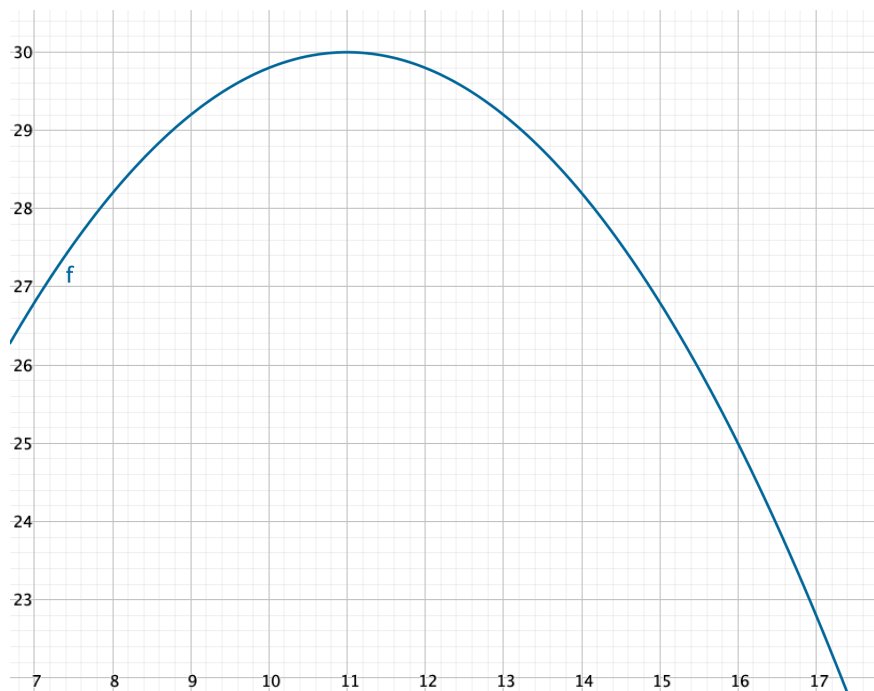


Figure 2: The graph of a quadratic function $f(x)$

Which statement is correct?

- (A) $f'(0) = 4$
- (B) $f(2) = f(18)$
- (C) $f'(21) = -4$
- (D) $f''(0) = 0$
- (E) I choose not to answer this problem.

Problem 10

We have a hyperbola function $f(x)$ with vertical asymptote $x = 20$ and horizontal asymptote $y = 50$. In addition $f(30) = 49$. Which statement is correct?

- (A) The graph of $f(x)$ has no tangents with slope -0.1
- (B) The graph of $f(x)$ has one tangent with slope -0.1
- (C) The graph of $f(x)$ has two tangents with slope -0.1
- (D) The graph of $f(x)$ has at least three tangents with slope -0.1
- (E) I choose not to answer this problem.

Problem 11

In figure 3 you see the graph of the cost function $K(x)$.

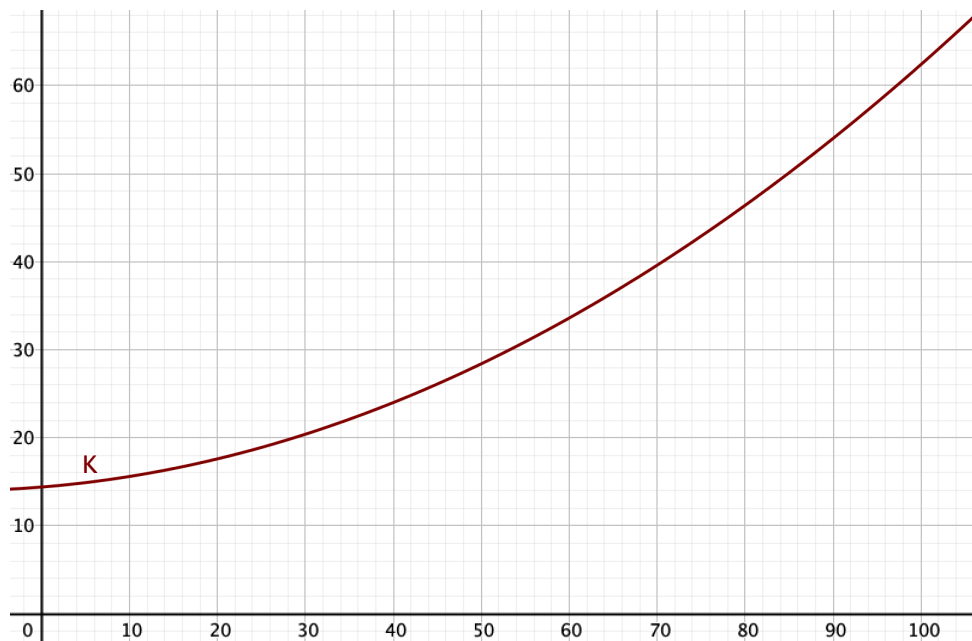


Figure 3: The graph of the cost function $K(x)$

Which statement is correct?

- (A) The cost optimum is between 75 and 90.
- (B) The cost optimum is between 30 and 40.
- (C) The cost optimum is between 100.
- (D) The cost optimum is between 55 and 65.
- (E) I choose not to answer this problem.

Problem 12

We have the function $f(x) = 5 - \ln(x)$ with domain $D_f = \langle 0, e^5 \rangle$. Then $f(x)$ has an inverse function $g(x)$ with domain D_g . Which statement is correct?

- (A) $D_g = [-5, \rightarrow)$
- (B) $D_g = \langle \leftarrow, 0 \rangle$
- (C) $D_g = [0, \rightarrow)$
- (D) $D_g = [5, \rightarrow)$
- (E) I choose not to answer this problem.

Problem 13

We have a function $f(x)$ with $f''(x) = e^x - 2$. Which statement is correct?

- (A) $f(x)$ is concave on the whole number line.
- (B) $f(x)$ is convex on the whole number line.
- (C) $f(x)$ is concave in the interval $\langle \leftarrow, 0 \rangle$ and convex in the interval $[0, \rightarrow)$.
- (D) $f(x)$ is concave in the interval $\langle \leftarrow, \ln(2) \rangle$ and convex in the interval $[\ln(2), \rightarrow)$.
- (E) I choose not to answer this problem.

Problem 14

Let $P_3(x)$ be the Taylor polynomial of degree 3 for the function $f(x) = \ln(x)$ about 1. Which statement is correct?

- (A) $P_3(2)$ is contained in the interval $\langle \leftarrow, 0.7 \rangle$.
- (B) $P_3(2)$ is contained in the interval $[0.7, 0.8)$.
- (C) $P_3(2)$ is contained in the interval $[0.8, 0.9)$.
- (D) $P_3(2)$ is contained in the interval $[0.9, \rightarrow)$.
- (E) I choose not to answer this problem.

Problem 15

We have a curve implicitly defined by the equation $5 \ln(y^2 + 1) = x - 10$. Which statement is correct?

- (A) There are exactly two points on the curve with x -coordinate 5.
- (B) There exists a point on the curve with x -coordinate greater than 8 such that the slope of the tangent at this point is 0.
- (C) There exists a point on the curve with $y = 1$ where the slope of the tangent is 0,2.
- (D) There exists a point on the curve with $y = -1$ where the the slope of the tangent is -2 .
- (E) I choose not to answer this problem.