Macroeconomics / Makroekonomie 318

Tutorial / Tutorial 2 Memo

May 18, 2022

Question / Vraag 1

You are provided with a table of values with data from the CPI and GDP indices. The first column provides the date, while the second column is is CPI and the third GDP.

Jy word voorsien van 'n tabel van waardes met data van die VPI- en BBP-indekse. Die eerste kolom verskaf die datum, terwyl die tweede kolom is VPI en die derde BBP.

Date (Datum)	CPI (VPI)	GDP (BBP)
2021-q3	134.44	540332
2021-q4	138.43	530221
2022-q1	140.21	578890

a.) Calculate the growth rates for CPI and GDP for the provided table.

a.) Bereken die groeikoerse vir VPI en BBP vir die bostaande tabel.

Partial answer: In this case we simply take the formula from our notes and apply it. For the first entry in the CPI table this would be,

$$\frac{138.43 - 134.44}{134.44} * 100$$

You can perform similar calculations for the growth rate of the other CPI row and GDP rows.

b.) Given the answers from a.) provide some insight into what is happening with inflation and GDP growth in this small sample.

b.) Gegewe die antwoorde van a.) gee 'n bietjie insig oor wat met inflasie en BBP-groei gebeur het.

Hint: For this question you need to consider whether the growth rates are increasing or decreasing. You should try and link the GDP growth to inflation, is there a positive or negative correlation?

Question 2 / Vraag 2

Provide the derivatives of the following functions,

Verskaf die afgeleides van die volgende funksies,

1. $f(x) = 243$
2. $g(x) = 12x^4$
3. $h(x) = (10x^2 - x)^3$
4. $i(x) = \sqrt{(5x + 8)} + 14x^2$
5. $j(x) = \frac{(12x^4+5)}{(10x^2-x)} = (12x^4 + 5)(10x^2 - x)^{-1}$
6. $k(x) = e^{12x}$

Partial answer: The derivatives are as follows,

1. $f'(x) = 0$
2. $g'(x) = 48x^3$
3. $h'(x) = 3(1 - 10x)^2x^2(20x - 1)$
4. $i'(x) = 28x + 5/(2\sqrt{(5x + 8)})$
5. $j'(x) = (240x^5 - 36x^4 - 100x + 5)/((1 - 10x)^2x^2)$
6. $k'(x) = 12e^{12x}$

Question 3 / Vraag 3

The following function is the total profit function for a firm that only produces one product. Determine if the function has a local maximum or minimum over the interval $[0, 10]$.

Die volgende funksie is die totale winsfunksie vir 'n firma wat slegs een produk produseer. Bepaal of die funksie 'n plaaslike maksimum of minimum het in die interval $[0, 10]$.

$$TP(x) = 200 + 30x - 8x^2 + 1/2x^3$$

Answer:

$$\frac{dTP}{dx} = -30 + 16x - 1.5x^2$$

Set the derivative equal to zero and solve,

$$-30 + 16x - 1.5x^2 = 0$$

Using factorisation we can find the answer for x as either 2.43 or 8.24. Next we look to the second order condition,

$$\frac{dTP^2}{dx^2} = 16 - 3x$$

We want to insert the values for x into this equation to determine if the second order derivative is positive or negative. In the case that it is negative we a maximum.

$x = 2.43 \rightarrow TP''(x) = 16 - 3(2.43) = 8.71 \rightarrow \text{Min}$

$x = 8.24 \rightarrow TP''(x) = 16 - 3(8.24) = -8.72 \rightarrow \text{Max}$

Question 4 / Vraag 4

Determine the partial derivative of the following function with respect to both x and y.

Bepaal die parsiële afgeleide van die volgende funksie met betrekking tot beide x en y.

$$m(x, y) = xy + 2x^2 - 4 + 15y^4 - \sqrt{(5y + 8)}$$

$$\frac{\partial m}{\partial x} = y + 4x$$

$$\frac{\partial m}{\partial y} = x + 60y^3 + 5/(2\sqrt{(5y + 8)})$$