

Math.Econ.Anal.MakeUp.Test.1. 15.dec.2.

1. (3+4+3 points)

A) $\bar{m} = (-2, 2)^T$, $\bar{p} = (2, 2)^T$. Solve $\alpha\bar{m} + \beta\bar{p} = (10, 4)^T$ for α and β !

B) Let $a_n = \frac{3n+2}{5n+4}$. Is a_n increasing or decreasing? (Prove it!)

Is a_n convergent as $n \rightarrow \infty$?

If the answer is yes, what is the limit of a_n ?

C) Compute $\lim_{n \rightarrow \infty} \left(1 - \frac{6}{5n}\right)^{5n-2}$!

2. (2+4+4 points)

A) Let $\bar{r}_0 = (1, 1, 1)^T$ and $\bar{n} = (2, 2, 2)^T$. Find an equation of the plane that contains \bar{r}_0 and has normal vector \bar{n} !

Express the third coordinate $z(x, y)$ of the point (x, y, z) of the plane with x and y !

B) Let $f(x) = 3x + 4$. If $a_0 = 13$ and $a_{n+1} = f(a_n) = 3a_n + 4$, then how much is a_n ?

B) How much is $|(3, 4, 5)^T|$? How much is $(3, 1, 4, 5)^T(1, 3, 4, 5)^T$?

3. (5 × 2 points)

(a) Compute $(x^3 \cos(4x))'$!

(b) Compute $(\cos(\sin(4x)))'$!

(c) Compute $((\sin(-2x))^2)'$!

(d) Compute $((-x)^3 + \sin(4x) - \sqrt[3]{(3x)^5})'$!

B) Let $f(x) = e^{-x}$, $x_0 = 1$. What is the prediction of the linear approximation of f around x_0 for the value of $f(x_0 + \Delta x)$?

4. (3+2+5 points)

A) Let $f(x) = 2^x$, $x_0 = 1$. Compute $\frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x}$!

B) Compute $\lim_{n \rightarrow \infty} \left(0.4 - \frac{6}{5n}\right)^{5n-2}$!

C) Study the monotonicity, convexity and the local extremal values of the function $f(x) = x - x^2$! Draw the graphs of f and f' in the same coordinate system!