

Econ.Math.Test.1

- Write down the $y = f(x)$ equation of the straight line going through the points $(4, 0)$ and $(0, 3)$.
 - What is the slope of $f(x)$?
 - Express x with y !
 - What is the $f^{-1}(x)$ inverse of the function $f(x)$?
 - Plot $f(x)$ and $f^{-1}(x)$ together!

2. Let $f(x) = 4 \cdot 2^{x+1}$.

- Compute $f^{-1}(x)$!
- Plot $f(x)$ and $f^{-1}(x)$ together!

3. Let $x_0 = 0$, $x_{n+1} = f(x_n) = 3x_n + 2$.

- If $f(x_{fix}) = x_{fix}$, then how much is x_{fix} ?
- How much is x_n ?
- If $x_3 = 33$, then how much is x_2 ?

4. Study the following sequences with regard to:

- monotonicity (only for $(1 - 2n)/(3n - 2)$),
- boundedness,
- limit, convergence.

$$\frac{1 - 2n}{3n - 2}, \quad (-1)^n \frac{1 - 2n}{3n - 2}, \quad (-1)^n \frac{3n^2 - n + 3}{n + 5n^2 + 1}, \quad (1 - 3/(4n))^{-3n+77}, \quad (1/3 - 3/(4n))^{-3n+77}.$$

5. Let $f(x) = x - 3x^2 + 2$, $x_0 = 3$.

- Compute

$$\frac{f(x_0 + \Delta x) - f(x_0)}{\Delta x}$$

- What is the limit of the previous expression as $\Delta x \rightarrow 0$?
- What is the prediction of the linear approximation of $f(x)$ around x_0 for the value of $f(x_0 + 0.01)$?

6. Compute the derivatives of the following functions:

$$\begin{aligned} &1/(3x)^2 + 1/\sqrt[3]{x} + 1/\sqrt[3]{5x}, \\ &\cos(4x + 1)/x^3, \\ &\ln((\ln(4x + 1))^2). \end{aligned}$$

7. Study the monotonicity, convexity and the local extremal values of $f(x)$! Find its limits as $x \rightarrow \pm\infty$! Draw also the graphs of $f(x)$ and $f'(x)$ in the same coordinate system!

$$(x + 1)e^{x+1}.$$