

Mathematics for Business**Series 1****(to be discussed on Wednesday, 19th of October 2016)**1. Solve the following equations for x :

a) $2x^4 - 8x^2 - 24 = 0$;

b) $\sqrt{2x^2 - 1} + x = 0$;

c) $|x^2 - x| = 6$;

d) $e^x + 2e^{-x} = 3$;

e) $\ln(\sqrt{x}) + \frac{3}{2}\ln(x) = \ln(2x)$;

f) $\sin(x) = \sqrt{1 - \sin(x)^2}$.

2. Determine all $x \in \mathbb{R}$ which satisfy the following inequalities:

a) $x^2 + x + 1 \geq 0$;

b) $|x - 1| \geq |x + 2|$.

3. How must the parameters $a, b \in \mathbb{R}$ be chosen so that the graph of the function $y = f(x) = ae^{-bx^2}$ passes through the points $A = (3.5, 12)$ and $B = (8, 2.4)$?

4. Suppose that the population of a country grows by 1% each year. After how many years has the population doubled?

5. a) Find the largest subset of \mathbb{R} on which the following functions can be defined:

(i) $y = f(x) = \frac{3x + 6}{x - 2}$, (ii) $y = f(x) = \ln(\sqrt{x^2 - 2x})$.

b) Determine the range and sketch the graph of the functions above.

c) Show that the function in (i) has an inverse function and determine its formula along with its domain of definition.

d) Show that the function in (ii) does not have an inverse function. Is it possible to reduce its domain of definition in such a way that an inverse function exists?