

Kenmerk : TW2015/BG10

Course : **Mathematics β 1 (Leibniz)**

Date : October 16, 2015

Time : 13.45 – 15.45 hrs

**Motivate all your answers.
The use of electronic devices is not allowed.**

1. (a) [3 pt] Solve the following initial value problem:

$$\begin{cases} y' + \frac{2}{x}y = \frac{1}{x^2}, \\ y(1) = 2. \end{cases}$$

- (b) [3 pt] Consider the following differential equation:

$$y' = \frac{y}{x} - e^{-y/x} \quad x > 0$$

Find the solution of this DE by making use of the function $v(x)$ that satisfies $y(x) = xv(x)$.

2. (a) [2 pt] Find the modulus (absolute value) and the argument van $w = \frac{4i}{1 + i\sqrt{3}}$.
(b) [2 pt] Solve: $z^3 = -8i$.

3. [2 pt] Proof: $z\bar{w} = \bar{z}w$ for every pair of two complex numbers z and w .

4. [5 pt] Determine the solution of the following second order differential equation:

$$y'' - 4y = xe^x + \cos(2x)$$

5. (a) [2 pt] Determine a vector \mathbf{n} perpendicular to the vectors $\mathbf{u} = \langle -1, 0, 6 \rangle$ and $\mathbf{v} = \langle 2, -5, -3 \rangle$.
(b) [3 pt] Proof: Two vectors \mathbf{u} and \mathbf{v} are parallel if and only if $\mathbf{u} \bullet \mathbf{v} = \pm|\mathbf{u}||\mathbf{v}|$.

Total: 22 points