

MATH1009 – Final (P2)
Wednesday, April 03, 2019
Instructor: Abuzer Yakaryılmaz

Name and surname:

Student number:

Questions

(120 minutes / 10 points in total)

1. (1 point) Let $A = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ be a matrix. Calculate A^{-1} .

2. (2 point) Calculate $\begin{vmatrix} 0 & 1 & 0 & 0 \\ -2 & 2 & -3 & 6 \\ 0 & 3 & 0 & 1 \\ -5 & 4 & 2 & -2 \end{vmatrix}$.

3. (1 point) Let $z = -1 - 2i$. Express the complex number $\frac{1}{z} + \frac{1}{\bar{z}}$ in the form of $x + iy$.

4. (1 point) Express the complex number $e^{i\frac{4\pi}{3}}$ in the form of $x + iy$.
Remember that $\sin \frac{\pi}{3} = \frac{\sqrt{3}}{2}$ and $\cos \frac{\pi}{3} = \frac{1}{2}$.

5. (2 point) Completely factor the polynomial $x^3 + 6x^2 + 11x + 6$.

6. (2 points) Let \star be a binary operation on the set $S = \{0, 1, 2, 3, 4, 5, 6\}$ defined as

$$a \star b = ab \pmod{7},$$

where $a, b \in S$.

a) Calculate $3 \star 3$, $4 \star 4$, $5 \star 5$, and $6 \star 6$.

b) Find 2^{-1} and 5^{-1} .

7. (1 point) Let $*$ be a binary operation on the positive real numbers defined as

$$a * b = 2ab,$$

where $a, b \in \mathbb{R}^+$.

a) What is the identity element for $*$?

b) Find 5^{-1} .

During the exam, please do not use any electronic device or any course (related) material.