

```
function quicksort(array)
  var list less, equal, greater
  if length(array) ≤ 1
    return array
  select a pivot value p not from array
  for each x in array
    if x < p then append x to less
    if x = p then append x to equal
    if x > p then append x to greater
  return concatenate(quicksort(list less), equal, quicksort(list greater))
```

Univerza na Primorskem
FAMNIT
Študijsko leto 2018/2019

Analiza I - Temelji analize
IZPIT - PRAKTIČNI DEL
– 3. SEPTEMBER, 2019 –

Čas: 80 minut. Največje možno število točk: 50. Pišite razločno. Vse odgovore je potrebno utemeljiti.

- (1) Naj bosta f in g realni funkciji realne spremenljivke, ki sta podani s predpisoma

$$f(x) = \frac{1}{1+x^2} \quad \text{in} \quad g(x) = \sqrt{\frac{1-x}{x}}$$

- (a) [6 t] Za vsako od funkcij f oz. g utemeljite ali je bijektivna.
(b) [8 t] Poiščite predpisa za kompozituma funkcij $f \circ g$ in $g \circ f$ ter zapišite njuni naravni definicijski območji in zalogi vrednosti.

- (2) Dani sta kompleksni števili $z = \frac{1+3\sqrt{3}i}{4-2\sqrt{3}i}$ in $w = \frac{2}{3} - \frac{2\sqrt{3}i}{3}$.

- (a) [6 t] Poiščite realni in imaginarni del kompleksnega števila z .
(b) [6 t] Kompleksno število w zapišite v polarni obliki.

- (3) [12 t] Naj bo

$$A = \{x \in \mathbb{R} \mid |3x+2| < 4|x-1|\}.$$

Določite tista izmed števil $\min A$, $\inf A$, $\max A$ in $\sup A$, ki obstajajo.

- (4) [12 t] Utemeljite, ali je realno zaporedje $(a_n)_{n \in \mathbb{N}}$, ki je podano z rekurzivno zvezo

$$a_{n+1} = \frac{5a_n}{3+a_n}$$

in prvem členom $a_1 = 1$, konvergentno.

```

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  return concatenate(quicksort(less), equal, quicksort(greater))

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University of Primorska
FAMNIT
Academic Year 2018/2019

Analysis I
FINAL EXAM - PRACTICAL PART
– SEPTEMBER 3, 2019 –

Time: 80 minutes. Maximum number of points: 50. Please write clearly, and justify all your answers.

- (1) Let f and g be real functions of a real variable given by

$$f(x) = \frac{1}{1+x^2} \quad \text{in} \quad g(x) = \sqrt{\frac{1-x}{x}}$$

- (a) [6 p] Is function f bijective? Is function g bijective? Justify your answer.
(b) [8 p] Find $f \circ g$ and $g \circ f$ with their domains and ranges.

(2) Let $z = \frac{1+3\sqrt{3}i}{4-2\sqrt{3}i}$ and $w = \frac{2}{3} - \frac{2\sqrt{3}i}{3}$.

- (a) [6 p] Find the real and the imaginary part of z .
(b) [6 p] State the polar form of w .

- (3) [12 p] Let

$$A = \{x \in \mathbb{R} \mid |3x+2| < 4|x-1|\}.$$

Find $\min A$, $\inf A$, $\max A$ and $\sup A$.

- (4) [12 p] Let $(a_n)_{n \in \mathbb{N}}$ be a real sequence such that

$$a_{n+1} = \frac{5a_n}{3+a_n}$$

and $a_1 = 1$. Is $(a_n)_{n \in \mathbb{N}}$ convergent? Justify your answer.