



Algebra I

1. KOLOKVIJ

– 19. NOVEMBER 2020 –

Čas pisanja: 90 minut. Maksimalno število točk: 50. Dovoljena je uporaba pisala, kalkulatorja in enega ročno napisanega lista formata A4 z definicijami in formulami (brez rešenih primerov). Pišite razločno in utemeljite vsak odgovor. Srečno!

1. V paralelogramu $ABCD$ točka E deli diagonalo AC tako, da velja $|AE| : |EC| = 1 : 3$ in točka F deli diagonalo BD tako, da velja $|BF| : |FD| = 3 : 1$. Naj bo točka S presečišče daljic AF in ED . Izrazite vektor \vec{DS} z vektorjema $\vec{e} = \vec{AC}$ in $\vec{f} = \vec{BD}$.

(Namig: V paralelogramu se diagonali razpolavljata.) (12 točk)

2. Dan imamo trikotnik ABC z oglišči $A(-1, 3, x + 5)$, $B(x, 2, 4)$ in $C(3, x - 1, 3)$.

(a) Določite $x \in \mathbb{R}$ tako, da bo dolžina stranice c (t.j. \vec{BA}) enaka 3. (6 točk)

(b) Izračunajte ploščino trikotnika (če ste za x dobili več možnih rešitev upoštevajte največjo). (6 točk)

3. Dano imamo ravnino $\Pi: x + y + z = 2$ in premico $p = (1, 1, 0) + \lambda(-1, 1, -2)$.

(a) Določite koordinate točke, v kateri premica p prebada ravnino Π . (3 točke)

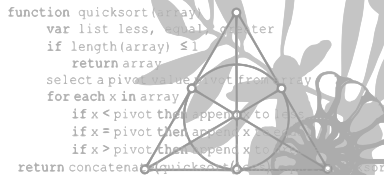
(b) Določite kot med ravnino Π in premico p . (3 točke)

(c) Zapišite vektorsko obliko enačbe premice q skozi točko $T(2, 1, -2)$, ki je vzporedna ravnini Π in pravokotna na premico p . (7 točk)

4. Naj bosta $\ell: \frac{x}{6} = \frac{y-3}{-2} = -z - 5$ in $p = (1, 7, -4) + \lambda(1, -3, 3)$ premici v prostoru.

(a) Izračunajte razdaljo med premicama ℓ in p . (6 točk)

(b) Zapišite splošno obliko enačbe ravnine Σ , ki vsebuje premico p in je vzporedna s premico ℓ . (7 točk)



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MIDTERM 1
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Time: 90 minutes. Maximum number of points: 50. You are allowed to use a pen, a calculator and one A4 hand-written piece of paper with definitions and formulas (and with no solved exercises). Write clearly, and justify all your answers. Good luck!

1. In a parallelogram $ABCD$ the point E divides the diagonal AC so that $|AE| : |EC| = 1 : 3$ and the point F divides the diagonal BD so that $|BF| : |FD| = 3 : 1$. Let S be the point of intersection of line segments AF and ED . Express the vector \vec{DS} with vectors $\vec{e} = \vec{AC}$ and $\vec{f} = \vec{BD}$.
(Hint: The diagonals of a parallelogram bisect each other.) (12 points)
2. Consider a triangle ABC defined by points $A(-1, 3, x + 5)$, $B(x, 2, 4)$ and $C(3, x - 1, 3)$.
 - (a) Determine $x \in \mathbb{R}$ so that the length of the side c (i.e. \vec{BA}) equals 3. (6 points)
 - (b) Determine the area of the triangle (if you got more than one solution for x , use the largest one). (6 points)
3. We are given the plane $\Pi: x + y + z = 2$ and the line $p = (1, 1, 0) + \lambda(-1, 1, -2)$.
 - (a) Determine the point of intersection of Π and p . (3 points)
 - (b) Determine the angle between Π and p . (3 points)
 - (c) Find the vector equation for the line q through the point $T(2, 1, -2)$ that is parallel to Π and orthogonal to p . (7 points)
4. Let $\ell : \frac{x}{6} = \frac{y-3}{-2} = -z - 5$ and $p = (1, 7, -4) + \lambda(1, -3, 3)$ be two lines in space.
 - (a) Determine the distance between ℓ and p . (6 points)
 - (b) Find the general form equation of the plane Σ that contains p and is parallel to ℓ . (7 points)