HIGHER LEVEL - 2022

Open questions

Question 1H.(2 p.)
Solve the equation $|x^2 - 2| = 2x - 1$.

Question 2H.(6 p.)
For which values of parameter m does the polynomial

$$f(x) = 2x^3 - (2+m)\,x^2 + (2m+2)\,x - m - 2$$

have three different real roots x_1, x_2, x_3 for which $\dfrac{1}{x_1} + \dfrac{1}{x_2} + \dfrac{1}{x_3} \geqslant 0$?

Question 3H(4 p.)
We are given the lengths of two sides of a triangle - a and b. Calculate the length of the third side, knowing that the sum of two heights of the triangle to the sides a and b is equal to the third height. Make a drawing.

Question 4H(4 p.)
Solve the inequality $\sin^4 x + \cos^4 x \leqslant \dfrac{3}{4}$.

Question 5H(4 p.)
On the graph of the function $y = \sqrt{2x}$ find a point which is closest to the point $P(3, 0)$. Make a drawing.

Question 6H(6 p.)
Acute angle of a parallelogram is equal to 45°. The point of intersections of its diagonals is at distances of 1 and $\sqrt{2}$ from sides. Calculete the area of this parallelogram and the lengths of diagonals. Make a drawing.

Question 7H(8 p.)
The base of a pyramid is a trapezoid with a circumference of 32. One base of the trapezoid is 3 times longer then the other base. All side edges of the pyramid slope to the base at an angle of 60°. Find the volume of the pyramid, given that into the base can be inscribed a circle. Make a drawing.