

Quantum Club

Entrance test 2021

Problems

1. Two objects are dropped from the same height at a 3-second interval with no initial velocity. How much time since the second object is dropped will elapse before they are 309 meters apart?
2. What curve does the equation $x^2 - ax + y^2 - by = 0$ (where $a > 0, b > 0$) represent?
3. Two dice are tossed. What is the expectation and variance of the product of the two numbers they show?
4. Solve the equation $\sin^4 x + \cos^4 x - \cos 2x = \frac{1}{2}$.
5. Calculate $\int \cos x(1 + \cos^2 x) dx$
6. Simplify $\frac{\tan 607.5^\circ - \tan 22.5^\circ}{\tan 427.5^\circ + \tan 742.5^\circ}$
7. Solve the equation $\log_2(x+1) = 4 - 2x - x^2$. Hint: try to plot both sides of the equation.
8. The four roots of the equation $x^4 - ax^2 + 9 = 0$ make up an arithmetic progression. Find a .