1. Differentiate x^x
2. W(t) is a Brownian motion. For arbitrary moments s and t what can you say about W(t) + W(s)?
3. x, y are N(0,1)-random variables correlated with correlation ρ. If y is fixed, what can you say about x?
4. Consider a trade where your cpty pays you 1mln usd in 5 years (one simple cashflow), 5Y CDS of the cpty is currently at 100 bps.
   What is CVA? List assumptions you make (term structure, LGD, etc.).
   Consider adding one more cashflow of 1mln usd in 3 years from your side to the cpty, your spread is the same as the cpty's – what is the effect?
5. You have a fair dice, 3 rolls with an option to stop – what's the price?
6. You have a fair coin, for a head you get $1, for a tail you lose $2. Find probability of going broke if you start form $50.
7. W(t) – standard BM, find E(sin W(t)), E(cos W(t))
8. W(t) – standard BM, find E(W^4)
9. X = N(\mu, \sigma^2), F is CDF of X. Find E(F(X)).
10. Hull-White model – what do coefficients mean? Assume mean reversion rate is constant. How does autocorrelation depend on it?
11. S(t) is a swap rate. How would you price a European option on S(t) with smooth payoff? What approximation would you use for the annuity?
12. 5 people of different ages take sits randomly at a round table. What's the probability of them sitting in the increasing age order?
13. What types of assumptions would you make if you are to price CVA for a swap (underlying model, calibration, …)? How collateral would influence your computations?
    Assume you have a liquid market of vanilla swaptions with restricted set of tenors. Do you need any model assumptions in order to price CVA?
14. How would you model a swaption on an amortized swap? What assumptions? How to calibrate?
15. How would you write unit tests for a black box function that computes the average?
16. Given a number A and an array, find the closest element, the second closest element.
17. Assume you have a text and a function that can split it into words. Describe how you find the most frequent word (data structure, algorithm).
18. Misc questions on C++
19. How would you model WWR (receiver swap with sovereign, XCCY usd/rub)? What models would you use in general? How would you hedge it?
20. How would you compute VaR?
21. What is CVA, EPE? EPE for a swap, why such a shape?
22. 1000 coins, one is double-header. You pick one at random and throw 10 times getting 10 heads. Find probability that you picked the double-header.
23. W(t) – standard BM.
    Find Prob(W(1) > 0, W(2) < 0).
    Find E(W(t) W(s)).
24. Black-Scholes:
    Given dS, find d(log S)
    Call-put parity
    How does European call depend on the strike, risk-free rate, time to maturity?
25. How to reverse single-linked list?
26. Write an algorithm for finding a square root.
27. What is Newton-Raphson?
28. Swaption: physical vs cash-settled – who would buy them and why?