2012年http://blog.renren.com/share/190087952/12142507769

Calculus  
1. (x+2y)在平面上两条曲线间的积分,没记住  
2. \int(0,pi/12) of (cosx-sinx) / (sinx + cosx) 还是神马的  
3. Extrema of f(x)=x^2+1/x  
4. Derivative of x^lnx  
5. Derivative of cos(x^2)  
6. x'(t)=ax+by, y'(t)=cx+dy, (forgot coefficients)，x(0)=4, y(0)=3, x(1)? (Maybe need to solve two ODEs and determine coefficients?)  
7. Fastest growing direction of f(x)=1/(1+ax^2+by^2+cz^2) at (1,1,-2)  
8. \int(0,inf) of exp(x^2/2)也可能是我看错题了是exp(-x^2/2)  
9. Similar to the question: What is the intersection volume of two unit Cylinder?  
   
Linear Algebra  
1. 解二元一次方程组。。。  
2. Under which situation will a linear system has no solutions.  
3. 6 variable，3 equation，in general how many dims do the solutions have?  
4. (Can't remember clearly) Positive definite matrix doesn't necessarily have property: 1)all strict positive diagonal/eigenvalue 2)all strict positive diagonal of Cholesky decomposition 3)all data positive 4)invertible  
   
Probability & Stat  
1. Two regular coins, one fake coin with both sides are heads. Toss one coin u got heads, what's that prob of tossing same coin and getting heads again?  
2. One regular coin, one fake coin. Pick one, toss it twice and get 2 heads. Prob of picking the fake coin?  
3. 52 poker cards => 4 piles，13 in each. 2 Aces in one pile，the other 2 Aces in two different piles, the rest pile doesn't have an Ace. Prob?  
4. X,Y,Z have equal corr, the lower bound of this corr? (-0.5)  
5. Random variable X,Y, Z, corr(X,Y)=corr(Y,Z)=c>0, what is the minimum correlation between X and Z? (2c^2-1)  
6. Given data and some statistics, what is the regression function?  
7. Uniform distribution, MLE estimator of a in U[0,a] ( (n+1)/n\*max(xi) )  
8. 10000 coins, prob of more than 4950 heads? (1-N(-1))  
9. 100 coins, prob of more than 60 heads? (1-N(-2))  
10.100 uniform variables, ...another central limit theory question  
11.18 socks, 12 in one color, 6 in the other color, prob of pick 2 to form a pair？  
12.Picking 2 from 52 poker cards, prob of a pair?  
13.X have 0 mean and 1 var, E(x+2)^2?  
14.X,Y have 0 mean and 1 var, E(X|X+Y=1)? or undetermined?  
15.Fill in blank: X1 X2 are iid, if for any a,b we can find c,d so that aX1+bX2 has same distribution of cX+d, then the distribution is: normal, Poisson, stable, (forgot the last choice)  
16.Two people (one from Harvard and one from MIT...) arrive uniformly between 12pm - 1pm, the prob of one person waiting another for less than 15 min? (1/4, 1/8, 1/16, ...绿皮书)  
17.Distribution of sample volatility divided by sample mean?(chi-square, gamma, F, t)  
18.Mode of (11,11,29,41,41,41)  
19.Standard diviation of (11,11,29,41,41,41)  
20.25 people are assigned seats but they sitted randomly, what is the expected number of people having original assigned seats: 1, 5, 25?  
   
Stochastic Process & Math Finance  
1. Expected time for Wt to hit boundary +-1 (1)  
2. Given zero bond price P(0,T)=1/(1+T^2), forward rate between (T1,T2)?  
3. An asset, (following GBM?) has $0 dollar value now, $1 in a year, what is the price at t=0.5: 0.5^(0.5), 0.5^(0.75), 0.5, 0.5^(1.25)?  
4. Radon-Nikodym derivative from real prob measure to forward measure, with respective of bond price P(0,t)  
5. Two independent Brownian motion (Bt, Wt), starting at point (1,1), what is the Probability of this curve hitting positive X-axis before hitting negative X-axis? (3/4)  
6. (Can't remember clearly) Given the process GBM(r,sigma?) of USD/GBP price in USD risk neutral measure, what is the GBP/USD in GBP? Drift term in choices are (-r, -r-sigma^2, -r+sigma^2)  
7. du/dt-5u=0, backward Euler-method, what choices of dt can make u unstable: 3,5,8,11,(Can't remember clearly) or all above?  
8. X=exp(Wt), E[X] at t=2? (e)  
9. Stock price follows GBM, r = 0.05, sigma = 0.3, spot = 100, prob of price<50 in one year from now?  
10.Binary call option, European price = 0.1, American price: 0.1, 0.2, 0.3, 0.4  
11.Two equivalent measure, P and P', P(A)=0.5, P(A')=? ( (0,1) )  
12.The spot is 10, if you think one-month later, the price will be 8 and 10 with equal probability, risk-free interest rate is 5%, what is the price of call option strike at 10? (between 5/1.05 and 10/1.05 because of risk-free probability.)  
13.Gaussian copula: hazard rate of A and B are 1% and 2%. A contract pay you $1 if A defaults earlier than B. The price of the contract has lowest price when the correlation is (0, 75%, 100%, ...)?  
14.Monte Carlo: to find out the mean of A, find a variable B, corr(A,B)=c, and simulate A + B(E(B)-B) instead of A. What is B? ( cov(a,b)/var(a), cov(a,b)/var(b), 1, -1 )  
15.Monte Carlo: need to simulate some rare event, so u need to simulate in a different measure. What is the name of this technique? (sequential resampling?)  
16.Variance of \int(t1,t2) of Wt^2dWt, and some other ito’s integral problems  
17.Dividend-paying stock (discrete dividend), the price difference of modeling in GBM and jump-diffusion  
   
Finance (FI and options)  
1. Bond: 5% coupon, (10year?) 1000 face, 6% yield, price?  
2. Bond: 3% coupon 10 year bond traded at par(100), what is the price if rate goes up 1bp: (99.91, 99.99, 100.01, ...)

3. Which is higher? FRA vs. Eurodollar futures  
4. At 2009, a trader believes that dividend in 2011 is lower than expectation, strategy? long/short 2010 forward and long/short 2011 forward?  
5. (Can't remember clearly) A trader observed that implied vol of OTM calls and puts are higher than that of ATM option, strategy: calendar spread, bull spread, bear spread, butterfly? (I guessed butterfly..)  
6. If asset price positive correlated with interest rate, future price is higher/lower than forward price? (higher)  
7. If interest rate is deterministic, future price is higher/lower than forward price? (equal)  
8. Long long-term ATM call and short short-term ATM call, adjust the ratio to make total vega zero. If before expiry of the short-term option, spot = strike again, vega: positive, negative, zero? (positive?)  
9.The trader wants to do a delta-hedge strategy, but he plugs wrong sigma1>implied vol, assume the portfolio is -C+delta\*S, what will the portfolio value change? when the stock increase/decrease, the value increase/decrease..  
10.Binary option, increase of delta: (positive, negative, it depends, ...)  
11.Theta is the partial derivative of (time)  
12.Which of the following is not Black Scholes assumption: (free borrow and lending at risk-free rate, no transaction cost, same tax rate?...)  
13.Volatility surface: on the strike dimension is flat, on the other dimension, the vol shape is: 1) increasing function of strike 2) decreasing with strike 3)frown 4)smile  
14.(Can't remember clearly) Condition of American call being exercised (I forgot whether dividend=0 or not)  
15.A default protection seller is long/short credit risk  
16.To hedge interest rate risk of 7 year bond of 100MM, you need to short 2 year bond of? 350MM?  
   
Programming  
1. The format of "<<" called in "cout<<t (an integer? I forgot) <<...", like "ostream& operator<< (ostream& out, T c )"?  
2. static member initialization: simple case (choose the one initialized out of the class)  
3. static member initialization: In template class, how many instances? 1) Cannot have static member in template class 2) only one instance 3) as many as instances of classes 4) as many as instantiations of classes  
4. static member initialization: multi-thread case  
5. 32-bit computer, non-optimized code: uint-32 a =16, c = 32, Q: prinft("%d") of unsigned int(a) - unsigned int(c): 0,8,16,32?  
6. space needed to store the number 1,000,000? 17,18,19,20? (20?)  
7. Time complexity of merge sort? ( O(nlogn) )  
8. (Can't remember clearly) Binary tree searching time with respect of n?  
9. How many comparisons are needed to sort 5 elements? (4)  
10.Searching in 10,000 data costs 1ns, 100,000 data? (10,35,100,350)  
11.Cannot use [ ] in: string, vector, list, ...(list)  
12.Which of the following does not store multiple elements contiguously? List, deque, vector, string(list)  
13.void\* in C is? (null pointer/pointer to nothing?)