

Codebook

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1 Basic

1.1 .vimrc

```

1
1
2
3
4 1 set nocompatible           " be iMproved, required
4 2 filetype off               " required
4 3
4 4 set rtp+=~/vim/bundle/vundle/
4 5 call vundle#rc()
4 6 Plugin 'gmarik/vundle'
4 7 Plugin 'tpope/vim-fugitive'
4 8 Plugin 'L9'
4 9 Plugin 'Lokaltog/vim-easymotion'
10 Plugin 'rstacruz/sparkup', {'rtp': 'vim/'}
11 Plugin 'valloric/YouCompleteMe'
12 Plugin 'scrooloose/nerdtree'
13 Plugin 'jistr/vim-nerdtree-tabs'
14 Plugin 'bling/vim-airline'
15 Plugin 'terryma/vim-multiple-cursors'
16 filetype plugin indent on    " required
17
18 "airline config
19 set laststatus=2
20 let g:airline_powerline_fonts=1
21 let g:airline#extensions#tabline#enabled=1
22 let g:airline#extensions#tabline#buffer_nr_show=1
23
24 "youcompltememe config
25 let g:ycm_global_ycm_extra_conf = '~/vim/.
    ycm_extra_conf.py'
26 let g:ycm_enable_diagnostic_signs = 0
27 let g:ycm_key_invoke_completion = '<c->'
28 set completeopt=menuone
29
30 "vim-easymotion config
31 map / <Plug>(easymotion-sn)
32 omap / <Plug>(easymotion-tn)
33 map n <Plug>(easymotion-next)
34 map N <Plug>(easymotion-prev)
35
36 set t_Co=256
37 set term=screen-256color
38 set number
39 map <F5> :NERDTreeTabsToggle <CR>
40
41 set tabstop=4
42 set shiftwidth=4
43 set softtabstop=4
44 set expandtab
45
46
47 set wrap
48 set showcmd
49 colorscheme torte
50 map <F2> :w <CR> :call OP() <CR>
51 map! <F2> <ESC> :w <CR> :call OP() <CR> <ESC>
52 map <F9> :w <CR> :call CP_R() <CR> <ESC>
53 map! <F9> <ESC> :w <CR> :call CP_R() <CR> <ESC>
54 map <HOME> ^
55 map! <HOME> <ESC>^i
56 map <ESC>OH <HOME>
57 map! <ESC>OH <HOME>
58 map <END> $
59 map <ESC>OF <END>
60 map! <ESC>OF <ESC><END>a
61 function CP_R()
62
63     if( &ft == 'cpp' )
64         let cpl = 'g++ -w -o "%:r.exe" -std=c++11 "%" |
            let exc = '"./%:r.exe"'
65     elseif( &ft == 'c' )
66         let cpl = 'gcc -w -o "%:r" -std=c99 "%" | let exc
            = '"./%:r"'
67     elseif( &ft == 'java' )
68         let cpl = 'javac "%" | let exc = 'java "%:r"'
69     elseif( &ft == 'python' )
70         let exc = 'python "%'
71     elseif( &ft == 'sh' )
72         let exc = 'sh "%'
73     endif
74

```

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75 let pause = 'printf "Press any key to continue..." &&
    read -n 1 && exit'
76 if !exists('exc')
77     echo 'Can't compile this filetype...'
78     return
79 endif
80 if exists('cpl')
81     let cp_r = cpl . ' && time ' . exc
82 else
83     let cp_r = 'time ' . exc
84 endif
85 "execute '!'$COLORTERM -x bash -c ' ' . cp_r . ' '; ' .
    pause . ' ;exec bash'''
86 execute '!' clear && ' ' . cp_r . ' && ' . pause
87 endfunction
88
89 function OP()
90     execute '!'$COLORTERM -x gedit ' . "%" . " ;"
91 endfunction

```

2 Number

```

1 #include <stdio.h>
2 #include <vector>
3 #include <math.h>
4 #include <complex>
5 #include <stdlib.h>
6 #include <time.h>
7 #include <iostream>
8 #include <algorithm>
9 using namespace std;
10 typedef long long ll;
11 #define EPS 1e-12
12 #define INF 1e15
13 typedef complex<double> Complex;
14 const double pi = acos(-1);
15
16 /* extended GCD */
17 ll ext_gcd(ll a, ll b, ll &x, ll &y){
18     ll d=a;
19     if(b!=0ll){
20         d=ext_gcd(b,a%b,y,x);
21         y--=(a/b)*x;
22     }
23     else x=1ll,y=0ll;
24     return d;
25 }
26
27 /*
28 * ax = b (mod n)
29 * return a set of answer(vector<ll>)
30 */
31 vector<ll> line_mod_equation(ll a, ll b, ll n){
32     ll x, y, d;
33     d = ext_gcd(a, n, x, y);
34     vector<ll> ans;
35     if(b%d==0ll){
36         x = (x%n + n) % n;
37         ans.push_back((x*(b/d))%(n/d));
38         for(ll i=1;i<d;i++){
39             ans.push_back((ans[0]+i*n/d)%n);
40         }
41         return ans;
42     }
43 }
44 /*
45 * find the inverse of n modular p
46 */
47 ll mod_inverse(ll n, ll p){
48     ll x, y;
49     ll d = ext_gcd(n, p, x, y);
50     return (p+x%p) % p;
51 }
52
53 /* P is the modular number */
54 #define P 24851
55 int fact[P+1];
56 /* called by Cmod */
57 int mod_fact(int n, int &e){
58     e = 0;
59     if(n == 0) return 1;

```

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60     int res = mod_fact(n/P, e);
61     e += n / P;
62     if((n/P) % 2 == 0)
63         return res * (fact[n%P]%P);
64     return res * ((P-fact[n%P])%P);
65 }
66 /*
67 * return C(n, m) mod P
68 */
69 int Cmod(int n, int m){
70     /* this section only need to be done once */
71     fact[0] = 1;
72     for(int i=1;i<=P;i++){
73         fact[i] = fact[i-1] * i%P;
74     }
75     /* end */
76     int a1, a2, a3, e1, e2, e3;
77     a1 = mod_fact(n, e1);
78     a2 = mod_fact(m, e2);
79     a3 = mod_fact(n-m, e3);
80     if(e1 > e2 + e3) return 0;
81     return a1 * mod_inverse(a2 * (a3%P), P) % P;
82 }
83
84 /*
85 * solve the chinese remainder theorem(CRT)
86 * if a.size() != m.size(), return -1
87 * return the minimum positive answer of CRT
88 * x = a[i] (mod m[i])
89 */
90 int CRT(vector<int> a, vector<int> m) {
91     if(a.size() != m.size()) return -1;
92     int M = 1;
93     for(int i=0;i<(int)m.size();i++){
94         M *= m[i];
95     }
96     int res = 0;
97     for(int i=0;i<(int)a.size();i++){
98         res = (res + (M/m[i])*mod_inverse(M/m[i], m[i])
99             *a[i]) % M;
100     }
101     return (res + M) % M;
102 }
103
104 /* fast exponential */
105 ll pow_mod(ll x, ll N, ll M) {
106     ll res = 1;
107     x %= M;
108     while(N){
109         if(N&1ll) res = mul_mod(res, x, M);
110         x = mul_mod(x, x, M);
111         N >>= 1;
112     }
113     return res;
114 }
115
116 /* called by MillerRabin */
117 bool PrimeTest(ll n, ll a, ll d) {
118     if(n == 2 || n == a) return true;
119     if((n&1) == 0) return false;
120     while((d&1) == 0) d >>= 1;
121     ll t = pow_mod(a, d, n);
122     while((d!=n-1) && (t!=1) && (t!=n-1)){
123         t = mul_mod(t, t, n);
124         d <= 1;
125     }
126     return (t==n-1) || ((d&1)==1);
127 }
128 /* return true if n is a prime */
129 bool MillerRabin(ll n){
130     // test set
131     vector<ll> a = {2, 7, 61};
132     for(int i=0;i<(int)a.size();i++){
133         if(!PrimeTest(n, a[i], n-1)) return false;
134     }
135     return true;
136 }
137 /*
138 * gen phi from 1~MAXN
139 * store answer in phi
140 */

```

```

141 #define MAXN 100
142 int mindiv[MAXN], phi[MAXN], sum[MAXN];
143 void genphi(){
144     for(int i=1;i<MAXN;i++){
145         mindiv[i] = i;
146         for(int j=2;j<MAXN;j++){
147             if(mindiv[j] == i)
148                 mindiv[j] = j/i;
149         }
150     }
151     phi[1] = 1;
152     for(int i=2;i<MAXN;i++){
153         phi[i] = phi[i/mindiv[i]] * mindiv[i];
154         if((i/mindiv[i])%mindiv[i] == 0)
155             phi[i] *= mindiv[i];
156         else phi[i] *= (mindiv[i]-1);
157     }
158 }
159 /*
160 * class of polynomial function
161 * coef is the coefficient
162 * f(x) = sigma(c[i]*x^i)
163 */
164 class Function {
165 public:
166     vector<double> coef;
167     Function(const vector<double> c=vector<double>()):
168         coef(c){}
169     double operator () (const double &rhs) const {
170         double res = 0.0;
171         double e = 1.0;
172         for(int i=0;i<(int)coef.size();i++,e*=rhs)
173             res += e * coef[i];
174         return res;
175     }
176     Function derivative() const {
177         vector<double> dc((int)this->coef.size()-1);
178         for(int i=0;i<(int)dc.size();i++)
179             dc[i] = coef[i+1] * (i+1);
180         return Function(dc);
181     }
182     int degree() const {
183         return (int)coef.size()-1;
184     }
185 };
186 //
187 /*
188 * calculate the integration of f(x) from a to b
189 * divided into n piece
190 * the bigger the n is, the more accurate the answer is
191 */
192 template<class T>
193 double simpson(const T &f, double a, double b){
194     double c = (a+b) / 2.0;
195     return (f(a)+4.0*f(c)+f(b)) * (b-a) / 6.0;
196 }
197 template<class T>
198 double simpson(const T &f, double a, double b, double
199 eps, double A){
200     double c = (a+b) / 2.0;
201     double L = simpson(f, a, c), R = simpson(f, c, b);
202     if(fabs(A-L-R) <= 15.0*eps) return L + R + (A-L-R)
203         / 15.0;
204     return simpson(f, a, c, eps/2, L) + simpson(f, c, b,
205         eps/2, R);
206 }
207 template<class T>
208 double simpson(const T &f, double a, double b, double
209 eps){
210     return simpson(f, a, b, eps, simpson(f, a, b));
211 }
212 /*
213 * called by find
214 * 1 = positive, -1 = negative, 0 = zero
215 */
216 int sign(double x){
217     return x < -EPS ? -1 : x > EPS;
218 }
219 /* called by equation */
220 template<class T>
221 double find(const T &f, double lo, double hi){
222     int sign_lo, sign_hi;
223     if((sign_lo=sign(f(lo))) == 0) return lo;
224     if((sign_hi=sign(f(hi))) == 0) return hi;
225     if(sign_lo * sign_hi > 0) return INF;
226     while(hi-lo>EPS){
227         double m = (hi+lo) / 2;
228         int sign_mid = sign(f(m));
229         if(sign_mid == 0) return m;
230         if(sign_lo * sign_mid < 0)
231             hi = m;
232         else lo = m;
233     }
234     return (lo+hi) / 2;
235 }
236 /*
237 * return a set of answer of f(x) = 0
238 */
239 template<class T>
240 vector<double> equation(const T &f){
241     vector<double> res;
242     if(f.degree() == 1){
243         if(sign(f.coef[1]))res.push_back(-f.coef[0]/f.
244             coef[1]);
245         return res;
246     }
247     vector<double> droot = equation(f.derivative());
248     droot.insert(droot.begin(), -INF);
249     droot.push_back(INF);
250     for(int i=0;i<(int)droot.size()-1;i++){
251         double tmp = find(f, droot[i], droot[i+1]);
252         if(tmp < INF) res.push_back(tmp);
253     }
254     return res;
255 }
256 /*
257 * called by FFT
258 * build the sequence of a that used to calculate FFT
259 * return a reversed sequence
260 */
261 vector<Complex> reverse(vector<Complex> a){
262     vector<Complex> res(a);
263     for (int i=1,j=0;i<(int)res.size();i++){
264         for(int k=((int)res.size())>>1;!(j^k)&k;k
265             >>=1);
266         if(i > j) swap(res[i], res[j]);
267     }
268     return res;
269 }
270 /*
271 * calculate the FFT of sequence
272 * a.size() must be 2^k
273 * flag = 1 -> FFT(a)
274 * falg = -1 -> FFT-1(a)
275 * return FFT(a) or FFT-1(a)
276 */
277 vector<Complex> FFT(vector<Complex> a, int flag=1){
278     vector<Complex> res = reverse(a);
279     for(int k=2;k<=(int)res.size();k<=1){
280         double p0 = -pi / (k>>1) * flag;
281         Complex unit_p0(cos(p0), sin(p0));
282         for(int j=0;j<(int)res.size();j+=k){
283             Complex unit(1.0, 0.0);
284             for(int i=j;i<j+k/2;i++,unit*=unit_p0){
285                 Complex t1 = res[i], t2 = res[i+k/2] *
286                     unit;
287                 res[i] = t1 + t2;
288                 res[i+k/2] = t1 - t2;
289             }
290         }
291     }
292     return res;
293 }
294 /*
295 * return the sequence of x-th of n!
296 * max(n) = 12
297 * 0 of 3! -> 123
298 * 5 of 3! -> 321
299 */

```

```

297 int factorial[] = {1, 1, 2, 6, 24, 120, 720, 5040,
    40320, 362880, 3628800, 39916800, 479001600};
298 vector<int> idx2permutation(int x, int n){
299     vector<bool> used(n+1, false);
300     vector<int> res(n);
301     for(int i=0;i<n;i++){
302         int tmp = x / factorial[n-i-1];
303         int j;
304         for(j=1;j<=n;j++){if(!used[j]){
305             if(tmp == 0) break;
306             tmp--;
307         }
308         res[i] = j, used[j] = true;
309         x %= factorial[n-i-1];
310     }
311     return res;
312 }
313 /*
314  * a is x-th og n!
315  * return x(0~n!)
316  * 123 of 3! -> 0
317  * 321 of 3! -> 5
318  */
319 int permutation2idx(vector<int> a){
320     int res = 0;
321     for(int i=0;i<(int)a.size();i++){
322         int tmp = a[i] - 1;
323         for(int j=0;j<i;j++){
324             if(a[j] < a[i]) tmp--;
325         }
326         res += factorial[(int)a.size()-i-1] * tmp;
327     }
328     return res;
329 }
330
331 int main(){
332     printf("%d\n", MillerRabin(10000000000000000911));
333 }

```

3 Matrix

4 Graph

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4.3 Two Sat

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