**ĐỒ HỌA MÁY TÍNH**

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| **CODE Vẽ và tô màu tam giác** |
| **#include<graphics.h>**  **#include<conio.h>**  **#include<math.h>**  **using namespace std;**  **void thietlapdohoa()**  **{**  **int gd=0,gm;**  **initgraph(&gd,&gm,"");**  **}**  **struct ToaDo**  **{**  **long x, y;**  **};**  **long Dtich(ToaDo A ,ToaDo B ,ToaDo C )**  **{**  **return abs(B.x\*A.y-A.x\*B.y+C.x\*B.y-B.x\*C.y+A.x\*C.y-C.x\*A.y);**  **}**  **bool KTra(ToaDo P, ToaDo A ,ToaDo B ,ToaDo C )**  **{**  **return Dtich(A, B, C) == Dtich(P,B,C) + Dtich(P,A,B) + Dtich(P,A,C);**  **}**  **void VeTamGiac(ToaDo A ,ToaDo B ,ToaDo C )**  **{**  **line(A.x, A.y,B.x, B.y);**  **line(C.x, C.y,B.x, B.y);**  **line(A.x, A.y,C.x, C.y);**  **}**  **void Fill(ToaDo A ,ToaDo B ,ToaDo C, int color )**  **{**  **//tim hinh chu nhat W bao da giac s**  **int xmin = A.x;**  **if(xmin>B.x) xmin = B.x;**  **if(xmin>C.x) xmin = C.x;**    **int xmax = A.x;**  **if(xmax<B.x) xmax = B.x;**  **if(xmax<C.x) xmax = C.x;**    **int ymin = A.y;**  **if(ymin>B.y) ymin = B.y;**  **if(ymin>C.y) ymin = C.y;**    **int ymax = A.y;**  **if(ymax<B.y) ymax = B.y;**  **if(ymax<C.y) ymax = C.y;**    **// to mau**  **ToaDo P;**  **for(P.x=xmin;P.x<=xmax;P.x++)**  **for(P.y=ymin;P.y<=ymax;P.y++)**  **if(KTra(P,A,B,C)) putpixel(P.x,P.y,color);**    **}**  **int main()**  **{**  **thietlapdohoa();**  **ToaDo A,B,C;**  **int color=14; // mau vang**  **A.x=50; A.y=70;**  **B.x=300; B.y=100;**  **C.x=160; C.y=200;**  **VeTamGiac(A,B,C);**  **getch();**  **Fill(A,B,C,color);**  **getch();**  **}** |

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| **CODE VẼ ĐỒ THỊ f(x) = ax3 + bx2 + cx + d trên đoạn [-10,10].** |
| **#include<conio.h>**  **#include<graphics.h>**  **float a,b,c,d,min,max;**  **int round(float x)**  **{**  **if (x>0) return int (x+0.5);**  **else return int (x-0.5);**  **}**  **void khoitaodohoa()**  **{**  **int gd=0,gm=0;**  **initgraph(&gd,&gm,"");**  **}**  **float f(float x)**  **{**  **return(a\*x\*x\*x+b\*x\*x+c\*x+d);**  **}**  **void vedothi(float min,float max)**  **{**  **int x0,y0,x1,y1,x2,y2;**  **float x,dx,k;**  **x0=getmaxx()/2;**  **y0=getmaxy()/2;**  **k=(float)getmaxx()/50;**  **dx=0.001;**  **setcolor(12);**  **line(0,y0,2\*x0,y0);**  **line(x0,0,x0,2\*y0);**  **x=min;**  **setcolor(14);**  **x1=x0+round(x\*k);**  **y1=y0-round(f(x)\*k);**  **moveto(x1,y1);**  **while (x<max)**  **{**  **x=x+dx;**  **x2=x0+round(x\*k);**  **y2=y0-round(f(x)\*k);**  **lineto(x2,y2);**  **}**  **}**  **int main()**  **{**  **khoitaodohoa();**  **min=-10;max=10;**  **a=1;b=-1;c=-1;d=2;**  **vedothi(min,max);**  **getch();**  **}** |

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| **CODE VẼ ĐỒ THỊ f(x) = ax4 + bx3 + cx2 + dx+e** |
| **#include<conio.h>**  **#include<graphics.h>**  **float a,b,c,d,e ,min,max;**  **int round(float x)**  **{**  **if (x>0) return int (x+0.5);**  **else return int (x-0.5);**  **}**  **void khoitaodohoa()**  **{**  **int gd=0,gm=0;**  **initgraph(&gd,&gm,"");**  **}**  **float f(float x)**  **{**  **return(a\*x\*x\*x\*x+b\*x\*x\*x+c\*x\*x+d\*x+e);**  **}**  **void vedothi(float min,float max)**  **{**  **int x0,y0,x1,y1,x2,y2,x3,y3;**  **float x,dx,k;**  **x0=getmaxx()/2;**  **y0=getmaxy()/2;**  **k=(float)getmaxx()/50;**  **dx=0.0001;**  **setcolor(12);**  **line(0,y0,2\*x0,y0);**  **line(x0,0,x0,2\*y0);**  **x=min;**  **setcolor(14);**  **x1=x0+round(x\*k);**  **y1=y0-round(f(x)\*k);**  **moveto(x1,y1);**  **x2=x0+round(x\*k);**  **y2=y0-round(f(x)\*k);**  **moveto(x2,y2);**  **while (x<max)**  **{**  **x=x+dx;**  **x3=x0+round(x\*k);**  **y3=y0-round(f(x)\*k);**  **lineto(x3,y3);**  **}**  **}**  **int main()**  **{**  **khoitaodohoa();**  **min=-5;max=5;**  **a=-1;b=-1;c=3;d=2;e=-6;**  **vedothi(min,max);**  **getch();**  **}** |

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| **CODE VẼ ĐỒ THỊ f(x) = ax2+bx+c** |
| #include <iostream> #include <conio.h> #include <math.h> #include <graphics.h> using namespace std; float a, b, c,min, max;  int round(float x) {     if (x>0) return int (x+0.5);     else return int (x-0.5); } void KhoiTaoDohoa() {     int gd=0,gm;     initgraph(&gd,&gm,""); }   float fb2(float x) {     return a\*x\*x+b\*x+c; } void vedothib2(float minn,float maxx) { int x0,y0,x1,y1,x2,y2;  float x,dx,k;  x0=getmaxx()/2;  y0=getmaxy()/2;  k=(float)getmaxx()/30;  dx=0.0001;  cleardevice();  setcolor(15);  line(0,y0,2\*x0,y0);  line(x0,0,x0,2\*y0);  x=minn;  setcolor(1);  x1=x0+round(x\*k);  y1=y0-round(fb2(x)\*k);  moveto(x1,y1);  while (x<maxx)  {     x=x+dx;     x2=x0+round(x\*k);     y2=y0-round(fb2(x)\*k);     lineto(x2,y2);  } } int main() {     KhoiTaoDohoa();     cleardevice();     a=-3;b=4;c=1;     vedothib2(-10,10);     getch(); } |

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| **CODE vẽ đa giác và tô loang** |
| #include<conio.h> #include<graphics.h> #include<iostream> #include <math.h> using namespace std;    struct toado { int x,y; }; toado A[100]; int n,mauvien = 4, x, y; //-------------------------------- void Nhap() { //cout<<"Nhap vao so dinh cua da giac:"; //cin>>n; //for (int i=0;i<n;++i) //{ //cout<<"\nA["<<i+1<<"].x="; //cin>>A[i].x;cout<<"\nA["<<i+1<<"].y="; //cin>>A[i].y; //} n = 3; A[0].x=10; A[0].y=10; A[1].x=200; A[1].y=50; A[2].x=50; A[2].y=300; x = 50; y = 50; } //-------------------------------- void Vedagiac(toado A[],int n,int color) { int i,j; setcolor(color); for(i=0;i<n;++i) { if (i==n-1) j=0; else  j=i+1; line(A[i].x,A[i].y,A[j].x,A[j].y); } } void Toloang(int x,int y,int color) { if (getpixel(x,y)!= mauvien && getpixel(x,y)!= color) { putpixel(x,y,color); Toloang(x+1,y,color); Toloang(x-1,y,color); Toloang(x,y+1,color); Toloang(x,y-1,color); } } //---------------------------- int main() { Nhap(); int gd= DETECT, gm; initgraph(&gd,&gm,""); Vedagiac(A,n,mauvien); getch(); Toloang(x,y,14); getch(); } |

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| **CODE THUAT TOÁN DDA VA THUAT TOAN BRESENHAM VẼ ĐOẠN THẲNG( CODE HINH LAP PHƯƠNG)** |
| **#include <iostream>**  **#include <graphics.h>**  **#include <math.h>**  **#define Round(a) (int)(a+0.5) // lam tron so**  **#define max(a,b) (a>b)?a:b**  **#define DELAY 10**  **#include <conio.h>**  **using namespace std ;**  **int color = BROWN;**    **void lineDDA(int x1, int y1, int x2, int y2){ // thuat toan DDA**  **int Dx = x2 - x1, Dy = y2 - y1;**  **float x\_inc , y\_inc;**  **float step=max(abs(Dx),abs(Dy));**  **x\_inc=Dx/step;**  **y\_inc=Dy/step;**  **float x=x1, y=y1;// Khoi tao cac gia tri ban dau**  **putpixel(x, y, color);**    **int k=1;**  **while(k <=step){**  **k++;**  **delay(DELAY); // thoi gian tre khi ve 1 diem anh**  **x += x\_inc;**  **y += y\_inc;**  **cout<<"x="<<x<<"\ty="<<y<<endl;**  **putpixel(Round(x),Round(y),color);**    **}**  **}**  **void Bresenham(int x1, int y1, int x2, int y2) // thuat toan BRESENHAM**  **{**  **int Dx = abs(x2 - x1);**  **int Dy = abs(y2 - y1);**  **int p = 2\*Dy - Dx;**  **int c1 = 2\*Dy;**  **int c2 = 2\*(Dy-Dx);**  **int x = x1;**  **int y = y1;**  **int x\_unit = 1, y\_unit = 1;**  **putpixel(x,y,color);**  **while(x != x2){**  **delay(DELAY);**  **if (p<0) p += c1;**  **else{**  **p += c2;**  **y += y\_unit;**  **}**  **x += x\_unit;**  **putpixel(x, y, color);**  **}**  **}**  **int main(){**  **int gd,gm;**  **gd=DETECT;**  **initgraph(&gd,&gm,NULL); // khoi tao cua so do hoa**  **//setcolor(5);**  **// settextstyle(5,0,4);**  **// outtextxy(250,20,"nguyenductin");**  **lineDDA(200,100,400,100); // ve duong thang DDA**  **lineDDA(200,100,200,300);**  **lineDDA(400,100,400,300);**  **lineDDA(400,300,200,300);**  **lineDDA(50,200,250,200);**  **lineDDA(250,200,250,400);**  **lineDDA(50,400,250,400);**  **lineDDA(50,200,50,400);**  **lineDDA(50,200,200,100);**  **lineDDA(50,400,200,300);**  **lineDDA(250,400,400,300);**  **lineDDA(250,200,400,100);**  **Bresenham(50,200,200,300); // ve duong thang BRESENHAM**  **Bresenham(250,200,400,300);**  **delay(9000);**  **// line(50,100,500,250); //ham ve dg thang trong thu vien graphics / winbgim**  **getch();**  **return 0;**  **}** |

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| **CODE THUẬT TOÁN VẼ ĐƯỜNG ELLIPSE BRESENHAM** |
| **#include<iostream>**  **#include<winbgim.h>**  **#include<math.h>**  **#include<conio.h>**  **using namespace std;**  **void Ve4diem(int xc,int yc,int x, int y,int color)//ve 4 diem doi xung**  **{**  **putpixel(xc+x,yc+y,color);**  **putpixel(xc-x,yc+y,color);**  **putpixel(xc-x,yc-y,color);**  **putpixel(xc+x,yc-y,color);**  **delay(50);**  **}**  **void Elipse(int x\_center,int y\_center,int a,int b,int color)// ve elipse**  **{**  **float p,a2,b2;**  **int x,y;**  **a2=pow(a,2);**  **b2=pow(b,2);**  **x=0;**  **y=b;**    **p=2\*((float)b2/a2)-(2\*b)+1;**    **//ve nhanh thu 1(tu tren xuong )**  **while(((float)b2/a2)\*x<=y)**  **{**  **Ve4diem(y\_center,y\_center,x,y,color);**  **if(p<0)**  **{**  **p=p+2\*((float)b2/a2)\*(2\*x+3);**  **}**  **else{**  **p= p- 4\*y + 2\*((float)b2/a2)\*(2\*x+3);**  **y--;**  **}**  **x++;**  **}**  **//ve nhanh thu 2(tu duoi len )**  **y=0;**  **x=a;**  **p=2\*((float)a2/b2)-2\*a+1;**  **while(((float)a2/b2)\*y<=x)**  **{**  **Ve4diem(y\_center,y\_center,x,y,color);**  **if(p<0)**  **{**  **p=p +2\*((float)a2/b2)\*(2\*y+3);**  **}**  **else**  **{**  **p=p- 4\*x + 2\*((float)a2/b2)\*(2\*y+3);**  **x=x-1;**  **}**  **y=y+1;**  **}**  **}**  **int main()**  **{**  **int x,y;**  **cout<<"\nNhap toa do tam Elip \nx: "; cin>>x;**  **cout<<"\ny: "; cin>>y;**  **initwindow(640,480);**  **Elipse(x,y,100,100,4);**  **Elipse(x,y,200,100,2);**  **getch();**  **return 0;**  **}** |

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| **Ve lap Phuong va to mau** |
| **#include <conio.h>**  **#include <iostream>**  **#include <graphics.h>**  **using namespace std;**  **struct Toado**  **{**  **int x,y;**  **};**  **Toado P[100];**  **int minx,maxx,n,color1,color2;**  **void Vedoanthang()**  **{**  **setcolor(BLUE);**  **line(200,100,400,100);**  **line(200,200,200,300);**  **line(400,100,400,300);**  **line(400,100,400,300);**  **line(50,200,250,200);**  **line(250,200,250,400);**  **line(50,400,250,400);**  **line(50,200,50,400);**  **line(50,200,200,100);**  **line(50,400,200,300);**  **line(250,400,400,300);**  **line(250,200,400,100);**  **line(200,300,400,300);**  **}**  **//------------------ --------------**  **void Nhaptoado(Toado a[],int &n)**  **{**  **/\***  **cout<<endl<<"Nhap so dinh cho da giac:";**  **cin>>n;**  **for(int i=1;i<=n;i++)**  **{**  **cout<<endl<<"a["<<i<<"].x=";**  **cin>>a[i].x;**  **cout<<endl<<"a["<<i<<"].y=";**  **cin>>a[i].y;**  **}**  **\*/**  **n=4;**  **P[1].x = 200;**  **P[1].y = 100;**  **P[2].x = 400;**  **P[2].y = 100;**  **P[3].x = 250;**  **P[3].y = 200;**  **P[4].x = 50;**  **P[4].y = 200;**  **minx=a[1].x;**  **maxx=a[1].x;**  **for (int i=2;i<=n;i++)**  **{**  **if (a[i].x<minx) minx=a[i].x;**  **if (a[i].x>maxx) maxx=a[i].x;**  **}**  **}**  **//--------------------------------**  **void Vedagiac(Toado a[],int n)**  **{**  **setcolor(4);**  **for (int i=1;i<=n;i++)**  **{**  **int j;**  **if (i==n) j=1;**  **else j=i+1;**  **line(a[i].x,a[i].y,a[j].x,a[j].y);**  **}**  **}**  **//--------------------------------**  **void Tomau(Toado a[],int n)**  **{**  **//Duy?t Dy t? Min t?i Max**  **for(int i=minx+1;i<=maxx-1;i++)**  **{**  **int m=0,t,s,tg,z[100];**  **//Tìm các giao di?m z[]**  **for (int j=1;j<=n;j++)**  **{**  **t=j+1; if (j==n) t=1;**  **s=j-1; if (j==1) s=n;**  **if (i==a[j].x)**  **{**  **if((i>min(a[s].x,a[t].x))&&(i<max(a[s].x,a[t].x)))**  **{**  **m++;**  **z[m]=a[j].y;**  **}**  **else**  **{**  **m++;**  **z[m]=a[j].y;**  **m++;**  **z[m]=a[j].y;**  **}**  **}**  **if ((i>min(a[j].x,a[t].x))&&(i<max(a[t].x,a[j].x)))**  **{**  **++m;**  **float r=(float)(a[t].y-a[j].y)/(a[t].x-a[j].x);**  **z[m]=(int)(r\*(i-a[j].x))+a[j].y;**  **}**  **}**  **//S?p x?p các giao di?m z[] tang d?n theo y**  **for(int j=1;j<=m-1;++j)**  **for (int k=j+1;k<=m;++k)**  **if (z[j]>z[k])**  **swap(z[j],z[k]);**  **//Tô màu các do?n t? giao di?m l? t?i giao di?m ch?n**  **setcolor(5);**  **for (int k=1;k<=m-1;k++)**  **if (k%2!=0) line(i,z[k],i,z[k+1]);**  **}**  **}**  **//--------------------------------**  **main()**  **{**  **int gd=0,gm;**  **Nhaptoado(P,n);**  **initgraph(&gd,&gm,"");**  **setcolor(9);**  **settextstyle(5,0,6);**  **outtextxy(250,20,"nguyenductin");**  **Vedagiac(P,n);**  **Tomau(P,n);**  **Vedoanthang();**  **getch();**  **}** |

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| **Thuật toán tô màu theo dòng quét (Scanline)** |
| **#include <conio.h>**  **#include <iostream>**  **#include <graphics.h>**  **using namespace std;**  **struct Toado**  **{**  **int x,y;**  **};**  **Toado P[100];**  **int minx,maxx,n,color1,color2;**  **//------------------ --------------**  **void Nhaptoado(Toado a[],int &n)**  **{**  **/\***  **cout<<endl<<"Nhap so dinh cho da giac:";**  **cin>>n;**  **for(int i=1;i<=n;i++)**  **{**  **cout<<endl<<"a["<<i<<"].x=";**  **cin>>a[i].x;**  **cout<<endl<<"a["<<i<<"].y=";**  **cin>>a[i].y;**  **}**  **\*/**  **n=8;**  **P[1].x = 50;**  **P[1].y = 250;**  **P[2].x = 250;**  **P[2].y = 300;**  **P[3].x = 350;**  **P[3].y = 260;**  **P[4].x = 270;**  **P[4].y = 180;**  **P[5].x = 300;**  **P[5].y = 150;**  **P[6].x = 200;**  **P[6].y = 50;**  **P[7].x = 70;**  **P[7].y = 100;**  **P[8].x = 150;**  **P[8].y = 150;**  **minx=a[1].x;**  **maxx=a[1].x;**  **for (int i=2;i<=n;i++)**  **{**  **if (a[i].x<minx) minx=a[i].x;**  **if (a[i].x>maxx) maxx=a[i].x;**  **}**  **}**  **//--------------------------------**  **void Vedagiac(Toado a[],int n)**  **{**  **setcolor(color1);**  **for (int i=1;i<=n;i++)**  **{**  **int j;**  **if (i==n) j=1;**  **else j=i+1;**  **line(a[i].x,a[i].y,a[j].x,a[j].y);**  **}**  **}**  **//--------------------------------**  **void Tomau(Toado a[],int n)**  **{**  **//Duy?t Dy t? Min t?i Max**  **for(int i=minx+1;i<=maxx-1;i++)**  **{**  **int m=0,t,s,tg,z[100];**  **//Tìm các giao di?m z[]**  **for (int j=1;j<=n;j++)**  **{**  **t=j+1; if (j==n) t=1;**  **s=j-1; if (j==1) s=n;**  **if (i==a[j].x)**  **{**  **if((i>min(a[s].x,a[t].x))&&(i<max(a[s].x,a[t].x)))**  **{**  **m++;**  **z[m]=a[j].y;**  **}**  **else**  **{**  **m++;**  **z[m]=a[j].y;**  **m++;**  **z[m]=a[j].y;**  **}**  **}**  **if ((i>min(a[j].x,a[t].x))&&(i<max(a[t].x,a[j].x)))**  **{**  **++m;**  **float r=(float)(a[t].y-a[j].y)/(a[t].x-a[j].x);**  **z[m]=(int)(r\*(i-a[j].x))+a[j].y;**  **}**  **}**  **//S?p x?p các giao di?m z[] tang d?n theo y**  **for(int j=1;j<=m-1;++j)**  **for (int k=j+1;k<=m;++k)**  **if (z[j]>z[k])**  **swap(z[j],z[k]);**  **//Tô màu các do?n t? giao di?m l? t?i giao di?m ch?n**  **setcolor(color2);**  **for (int k=1;k<=m-1;k++)**  **if (k%2!=0) line(i,z[k],i,z[k+1]);**  **}**  **}**  **//--------------------------------**  **main()**  **{**  **int gd=0,gm;**  **Nhaptoado(P,n);**  **cout<<endl<<"Nhap mau duong vien:";**  **cin>>color1;**  **cout<<endl<<"Nhap mau to da giac:";**  **cin>>color2;**  **initgraph(&gd,&gm,"");**  **Vedagiac(P,n);**  **Tomau(P,n);**  **getch();**  **}** |

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| **Khối chop SABCD** |
| **#include <iostream>**  **#include <graphics.h>**  **#include <math.h>**  **#define Round(a) (int)(a+0.5) // lam tron so**  **#define max(a,b) (a>b)?a:b**  **#define DELAY 10**  **#include <conio.h>**  **using namespace std ;**  **int color = YELLOW;**    **void lineDDA(int x1, int y1, int x2, int y2){ // thuat toan DDA**  **int Dx = x2 - x1, Dy = y2 - y1;**  **float x\_inc , y\_inc;**  **float step=max(abs(Dx),abs(Dy));**  **x\_inc=Dx/step;**  **y\_inc=Dy/step;**  **float x=x1, y=y1;// Khoi tao cac gia tri ban dau**  **putpixel(x, y, color);**    **int k=1;**  **while(k <=step){**  **k++;**  **delay(DELAY); // thoi gian tre khi ve 1 diem anh**  **x += x\_inc;**  **y += y\_inc;**  **cout<<"x="<<x<<"\ty="<<y<<endl;**  **putpixel(Round(x),Round(y),color);**    **}**  **}**  **void Bresenham(int x1, int y1, int x2, int y2) // thuat toan BRESENHAM**  **{**  **int Dx = abs(x2 - x1);**  **int Dy = abs(y2 - y1);**  **int p = 2\*Dy - Dx;**  **int c1 = 2\*Dy;**  **int c2 = 2\*(Dy-Dx);**  **int x = x1;**  **int y = y1;**  **int x\_unit = 1, y\_unit = 1;**  **putpixel(x,y,color);**  **while(x != x2){**  **delay(DELAY);**  **if (p<0) p += c1;**  **else{**  **p += c2;**  **y += y\_unit;**  **}**  **x += x\_unit;**  **putpixel(x, y, color);**  **}**  **}**  **int main(){**  **int gd,gm;**  **gd=DETECT;**  **initgraph(&gd,&gm,NULL); // khoi tao cua so do hoa**  **setcolor(5);**  **settextstyle(3,0,5);**  **outtextxy(150,20,"S");**  **settextstyle(3,0,5);**  **outtextxy(400,260,"D");**  **settextstyle(3,0,5);**  **outtextxy(300,350,"C");**  **settextstyle(3,0,5);**  **outtextxy(50,360,"B");**  **settextstyle(3,0,5);**  **outtextxy(150,260,"A");**    **lineDDA(150,50,150,250);**  **lineDDA(150,50,50,350);**  **lineDDA(150,50,300,350);**  **lineDDA(150,50,400,250);**  **lineDDA(150,250,400,250);**  **lineDDA(150,250,50,350);**  **lineDDA(400,250,300,350);**  **lineDDA(300,350,50,350);**  **delay(9000);**  **// line(50,100,500,250); //ham ve dg thang trong thu vien graphics / winbgim**  **getch();**  **return 0;**  **}** |

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| **Phóng to đối xứng qua goc tọa độ** |
| **#include<conio.h>**  **#include<math.h>**  **#include<graphics.h>**  **#define Step 5;**  **void thietlapdohoa()**  **{**  **int gd=0,gm;**  **initgraph(&gd,&gm,"");**  **}**  **void vehinh(int x0,int y0)**  **{**  **rectangle(250,250,x0,y0);**  **}**  **int main()**  **{**  **int x0,y0;**  **char ch;**  **thietlapdohoa();**  **x0=getmaxx()/2;**  **y0=getmaxy()/2;**  **int x10pt=0.01\*x0;**  **int y10pt=0.01\*y0;**  **setwritemode(XOR\_PUT);**  **vehinh(x0,y0);**  **do**  **{ ch=getch();**  **switch(ch)**  **{**  **case 72: //phím ?**  **vehinh(x0,y0);**  **x0+=x10pt;**  **y0+=y10pt;**  **vehinh(x0,y0);**  **break;**  **case 80: //phím ?**  **vehinh(x0,y0);**  **x0-=x10pt;**  **y0-=y10pt;**  **vehinh(x0,y0);**  **break;**  **}**  **} while(ch!=27);**  **getch();**  **closegraph();**  **}** |

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| **DỊCH CHUYỂN 1 MẶT BÊN CỦA HÌNH LẬP PHƯƠNG** |
| **#include <conio.h>**  **#include <iostream>**  **#include <graphics.h>**  **#define Step 5;**  **using namespace std;**  **struct Toado**  **{**  **int x,y;**  **};**  **Toado P[100];**  **int minx,maxx,n,color1,color2;**  **void vehinh(int x0,int y0)**  **{**  **rectangle(x0,y0,x0+200,y0+200);**  **}**  **void Vedoanthang()**  **{**  **setcolor(BLUE);**  **line(200,100,400,100);**  **//line(200,200,200,300);**  **line(400,100,400,300);**  **line(400,100,400,300);**  **line(50,200,250,200);**  **//line(250,200,250,400);**  **//line(50,400,250,400);**  **//line(50,200,50,400);**  **line(50,200,200,100);**  **// line(50,400,200,300);**  **line(250,400,400,300);**  **line(250,200,400,100);**  **// line(200,300,400,300);**  **}**  **//------------------ --------------**  **void Nhaptoado(Toado a[],int &n)**  **{**  **/\***  **cout<<endl<<"Nhap so dinh cho da giac:";**  **cin>>n;**  **for(int i=1;i<=n;i++)**  **{**  **cout<<endl<<"a["<<i<<"].x=";**  **cin>>a[i].x;**  **cout<<endl<<"a["<<i<<"].y=";**  **cin>>a[i].y;**  **}**  **\*/**  **n=4;**  **P[1].x = 200;**  **P[1].y = 100;**  **P[2].x = 400;**  **P[2].y = 100;**  **P[3].x = 250;**  **P[3].y = 200;**  **P[4].x = 50;**  **P[4].y = 200;**  **minx=a[1].x;**  **maxx=a[1].x;**  **for (int i=2;i<=n;i++)**  **{**  **if (a[i].x<minx) minx=a[i].x;**  **if (a[i].x>maxx) maxx=a[i].x;**  **}**  **}**  **//--------------------------------**  **void Vedagiac(Toado a[],int n)**  **{**  **setcolor(4);**  **for (int i=1;i<=n;i++)**  **{**  **int j;**  **if (i==n) j=1;**  **else j=i+1;**  **line(a[i].x,a[i].y,a[j].x,a[j].y);**  **}**  **}**  **//--------------------------------**  **void Tomau(Toado a[],int n)**  **{**  **//Duy?t Dy t? Min t?i Max**  **for(int i=minx+1;i<=maxx-1;i++)**  **{**  **int m=0,t,s,tg,z[100];**  **//Tìm các giao di?m z[]**  **for (int j=1;j<=n;j++)**  **{**  **t=j+1; if (j==n) t=1;**  **s=j-1; if (j==1) s=n;**  **if (i==a[j].x)**  **{**  **if((i>min(a[s].x,a[t].x))&&(i<max(a[s].x,a[t].x)))**  **{**  **m++;**  **z[m]=a[j].y;**  **}**  **else**  **{**  **m++;**  **z[m]=a[j].y;**  **m++;**  **z[m]=a[j].y;**  **}**  **}**  **if ((i>min(a[j].x,a[t].x))&&(i<max(a[t].x,a[j].x)))**  **{**  **++m;**  **float r=(float)(a[t].y-a[j].y)/(a[t].x-a[j].x);**  **z[m]=(int)(r\*(i-a[j].x))+a[j].y;**  **}**  **}**  **//S?p x?p các giao di?m z[] tang d?n theo y**  **for(int j=1;j<=m-1;++j)**  **for (int k=j+1;k<=m;++k)**  **if (z[j]>z[k])**  **swap(z[j],z[k]);**  **//Tô màu các do?n t? giao di?m l? t?i giao di?m ch?n**  **setcolor(4);**  **for (int k=1;k<=m-1;k++)**  **if (k%2!=0) line(i,z[k],i,z[k+1]);**  **}**  **}**  **//--------------------------------**  **main()**  **{**  **int z0,k0;**  **char ch;**  **int gd=0,gm;**  **Nhaptoado(P,n);**  **initgraph(&gd,&gm,"");**  **setcolor(9);**  **settextstyle(4,0,4);**  **outtextxy(250,20,"NguyenDucTin");**  **setcolor(5);**  **settextstyle(3,0,5);**  **outtextxy(200,60,"F");**  **settextstyle(3,0,5);**  **outtextxy(400,80,"D");**  **settextstyle(3,0,5);**  **outtextxy(400,320,"C");**  **settextstyle(3,0,5);**  **outtextxy(250,420,"B");**  **settextstyle(3,0,5);**  **outtextxy(50,420,"A");**  **settextstyle(3,0,5);**  **outtextxy(10,180,"M");**  **settextstyle(3,0,5);**  **outtextxy(210,210,"N");**  **Vedagiac(P,n);**  **Tomau(P,n);**  **Vedoanthang();**  **z0=50;**  **k0=200;**  **setwritemode(XOR\_PUT);**  **vehinh(z0,k0);**  **do**  **{ ch=getch();**  **switch(ch)**  **{**  **case 75: //phím ?**  **vehinh(z0,k0);**  **z0-=Step;**  **vehinh(z0,k0);**  **break;**  **case 77: //phím ?**  **vehinh(z0,k0);**  **z0+=Step;**  **vehinh(z0,k0);**  **break;**  **case 72: //phím ?**  **vehinh(z0,k0);**  **k0-=Step;**  **vehinh(z0,k0);**  **break;**  **case 80: //phím ?**  **vehinh(z0,k0);**  **k0+=Step;**  **vehinh(z0,k0);**  **break;**  **}**  **} while(ch!=27);**  **closegraph();**  **getch();**  **}** |

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| **Giua ki** |
| **#include <conio.h>**  **#include <iostream>**  **#include <graphics.h>**  **#define Step 5;**  **using namespace std;**  **struct Toado**  **{**  **int x,y;**  **};**  **Toado P[100];**  **int minx,maxx,n,color1,color2;**  **void vehinh(int x0,int y0)**  **{**  **rectangle(x0,y0,x0+200,y0+200);**  **}**  **void Vedoanthang()**  **{**  **setcolor(BLUE);**  **line(200,100,400,200);**  **//line(200,200,200,300);**  **line(400,200,250,350);**  **// line(400,100,400,300);**  **//line(50,200,250,200);**  **//line(250,200,250,400);**  **//line(50,400,250,400);**  **//line(50,200,50,400);**  **// line(50,200,200,100);**  **// line(50,400,200,300);**  **//line(250,400,400,300);**  **// line(250,200,400,100);**  **// line(200,300,400,300);**  **}**  **//------------------ --------------**  **void Nhaptoado(Toado a[],int &n)**  **{**  **/\***  **cout<<endl<<"Nhap so dinh cho da giac:";**  **cin>>n;**  **for(int i=1;i<=n;i++)**  **{**  **cout<<endl<<"a["<<i<<"].x=";**  **cin>>a[i].x;**  **cout<<endl<<"a["<<i<<"].y=";**  **cin>>a[i].y;**  **}**  **\*/**  **n=3;**  **P[1].x = 200;**  **P[1].y = 100;**  **P[2].x = 50;**  **P[2].y = 250;**  **P[3].x = 250;**  **P[3].y = 350;**  **minx=a[1].x;**  **maxx=a[1].x;**  **for (int i=2;i<=n;i++)**  **{**  **if (a[i].x<minx) minx=a[i].x;**  **if (a[i].x>maxx) maxx=a[i].x;**  **}**  **}**  **//--------------------------------**  **void Vedagiac(Toado a[],int n)**  **{**  **setcolor(4);**  **for (int i=1;i<=n;i++)**  **{**  **int j;**  **if (i==n) j=1;**  **else j=i+1;**  **line(a[i].x,a[i].y,a[j].x,a[j].y);**  **}**  **}**  **//--------------------------------**  **void Tomau(Toado a[],int n)**  **{**  **//Duy?t Dy t? Min t?i Max**  **for(int i=minx+1;i<=maxx-1;i++)**  **{**  **int m=0,t,s,tg,z[100];**  **//Tìm các giao di?m z[]**  **for (int j=1;j<=n;j++)**  **{**  **t=j+1; if (j==n) t=1;**  **s=j-1; if (j==1) s=n;**  **if (i==a[j].x)**  **{**  **if((i>min(a[s].x,a[t].x))&&(i<max(a[s].x,a[t].x)))**  **{**  **m++;**  **z[m]=a[j].y;**  **}**  **else**  **{**  **m++;**  **z[m]=a[j].y;**  **m++;**  **z[m]=a[j].y;**  **}**  **}**  **if ((i>min(a[j].x,a[t].x))&&(i<max(a[t].x,a[j].x)))**  **{**  **++m;**  **float r=(float)(a[t].y-a[j].y)/(a[t].x-a[j].x);**  **z[m]=(int)(r\*(i-a[j].x))+a[j].y;**  **}**  **}**  **//S?p x?p các giao di?m z[] tang d?n theo y**  **for(int j=1;j<=m-1;++j)**  **for (int k=j+1;k<=m;++k)**  **if (z[j]>z[k])**  **swap(z[j],z[k]);**  **//Tô màu các do?n t? giao di?m l? t?i giao di?m ch?n**  **setcolor(14);**  **for (int k=1;k<=m-1;k++)**  **if (k%2!=0) line(i,z[k],i,z[k+1]);**  **}**  **}**  **//--------------------------------**  **main()**  **{**  **int z0,k0;**  **char ch;**  **int gd=0,gm;**  **Nhaptoado(P,n);**  **initgraph(&gd,&gm,"");**  **setcolor(9);**  **settextstyle(4,0,4);**  **outtextxy(250,20,"NguyenDucTin");**  **setcolor(5);**  **settextstyle(3,0,5);**  **outtextxy(200,70,"A");**  **settextstyle(3,0,5);**  **outtextxy(420,200,"D");**  **settextstyle(3,0,5);**  **outtextxy(250,360,"C");**  **settextstyle(3,0,5);**  **outtextxy(50,260,"B");**    **Vedagiac(P,n);**  **Tomau(P,n);**  **Vedoanthang();**  **/\* z0=50;**  **k0=200;**  **setwritemode(XOR\_PUT);**  **vehinh(z0,k0);**  **do**  **{ ch=getch();**  **switch(ch)**  **{**  **case 75: //phím ?**  **vehinh(z0,k0);**  **z0-=Step;**  **vehinh(z0,k0);**  **break;**  **case 77: //phím ?**  **vehinh(z0,k0);**  **z0+=Step;**  **vehinh(z0,k0);**  **break;**  **case 72: //phím ?**  **vehinh(z0,k0);**  **k0-=Step;**  **vehinh(z0,k0);**  **break;**  **case 80: //phím ?**  **vehinh(z0,k0);**  **k0+=Step;**  **vehinh(z0,k0);**  **break;**  **}**  **} while(ch!=27);**  **closegraph();\*/**  **getch();**  **}** |

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| **Hin thang** |
| **include <bits/stdc++.h>**  **#include <graphics.h>**    **using namespace std;**    **int mauvien = 4;**    **void toloang(int x, int y, int color) {**  **if(getpixel(x, y) != mauvien && getpixel(x, y) != color) {**  **putpixel(x, y, color);**  **toloang(x+1, y, color);**  **toloang(x-1, y, color);**  **toloang(x, y+1, color);**  **toloang(x, y-1, color);**  **}**  **}**    **void vehinh(int x1, int y1, int x2, int y2, int x3, int y3, int x4, int y4) {**  **line(x1, y1, x2, y2);**  **line(x2, y2, x3, y3);**  **line(x3, y3, x4, y4);**  **line(x4, y4, x1, y1);**  **}**    **int main() {**  **int step = 10;**  **int x1 = 100, y1 = 100, x2 = 300, y2 = 100, x3 = 550, y3 = 300, x4 = 100, y4 = 300;**  **initwindow(1000, 1000);**  **settextstyle(4, 0, 4);**  **outtextxy(0, 0, "Tran Viet Phuoc");**  **getch();**  **setcolor(mauvien);**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **getch();**  **toloang(101, 101, 14);**  **char ch;**  **getch();**  **setwritemode(XOR\_PUT);**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **do {**  **ch = getch();**  **switch(ch) {**  **case 72: {**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **y1 -= step;**  **y2 -= step;**  **y3 -= step;**  **y4 -= step;**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **break;**  **}**    **case 75: {**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **x1 -= step;**  **x2 -= step;**  **x3 -= step;**  **x4 -= step;**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **break;**  **}**    **case 77: {**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **x1 += step;**  **x2 += step;**  **x3 += step;**  **x4 += step;**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **break;**  **}**    **case 80: {**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **y1 += step;**  **y2 += step;**  **y3 += step;**  **y4 += step;**  **vehinh(x1, y1, x2, y2, x3, y3, x4, y4);**  **break;**  **}**  **}**  **} while(ch != 27);**  **}** |

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| **Giua ki lan 2** |
| **#include <conio.h>**  **#include <iostream>**  **#include <graphics.h>**  **using namespace std;**  **struct Toado**  **{**  **int x,y;**  **};**  **Toado P[100];**  **int minx,maxx,n,color1,color2;**  **/\*void vehinh(int x0,int y0)**  **{**  **rectangle(x0,y0,x0+200,y0+200);**  **}\*/**  **void vehinh(int x1, int y1, int x2, int y2, int x3, int y3)**  **{**  **setcolor(BLUE);**    **line(x1, y1, x2, y2);**  **line(x2, y2, x3, y3);**  **line(x3, y3, x1, y1);**  **// line(x4, y4, x1, y1);**  **//line(200,100,400,200);**  **//line(200,200,200,300);**  **//line(400,200,250,350);**  **// line(400,100,400,300);**  **//line(50,200,250,200);**  **//line(250,200,250,400);**  **//line(50,400,250,400);**  **//line(50,200,50,400);**  **// line(50,200,200,100);**  **// line(50,400,200,300);**  **//line(250,400,400,300);**  **// line(250,200,400,100);**  **// line(200,300,400,300);**  **}**  **//------------------ --------------**  **void Nhaptoado(Toado a[],int &n)**  **{**  **/\***  **cout<<endl<<"Nhap so dinh cho da giac:";**  **cin>>n;**  **for(int i=1;i<=n;i++)**  **{**  **cout<<endl<<"a["<<i<<"].x=";**  **cin>>a[i].x;**  **cout<<endl<<"a["<<i<<"].y=";**  **cin>>a[i].y;**  **}**  **\*/**  **n=3;**  **P[1].x = 200;**  **P[1].y = 100;**  **P[2].x = 50;**  **P[2].y = 250;**  **P[3].x = 250;**  **P[3].y = 350;**  **/\***  **P[1].x = 50;**  **P[1].y = 200;**  **P[2].x = 50;**  **P[2].y = 200;**  **P[3].x = 250;**  **P[3].y = 400;\*/**  **minx=a[1].x;**  **maxx=a[1].x;**  **for (int i=2;i<=n;i++)**  **{**  **if (a[i].x<minx) minx=a[i].x;**  **if (a[i].x>maxx) maxx=a[i].x;**  **}**  **}**  **//--------------------------------**  **void Vedagiac(Toado a[],int n)**  **{**  **setcolor(4);**  **for (int i=1;i<=n;i++)**  **{**  **int j;**  **if (i==n) j=1;**  **else j=i+1;**  **line(a[i].x,a[i].y,a[j].x,a[j].y);**  **}**  **}**  **//--------------------------------**  **void Tomau(Toado a[],int n)**  **{**  **//Duy?t Dy t? Min t?i Max**  **for(int i=minx+1;i<=maxx-1;i++)**  **{**  **int m=0,t,s,tg,z[100];**  **//Tìm các giao di?m z[]**  **for (int j=1;j<=n;j++)**  **{**  **t=j+1; if (j==n) t=1;**  **s=j-1; if (j==1) s=n;**  **if (i==a[j].x)**  **{**  **if((i>min(a[s].x,a[t].x))&&(i<max(a[s].x,a[t].x)))**  **{**  **m++;**  **z[m]=a[j].y;**  **}**  **else**  **{**  **m++;**  **z[m]=a[j].y;**  **m++;**  **z[m]=a[j].y;**  **}**  **}**  **if ((i>min(a[j].x,a[t].x))&&(i<max(a[t].x,a[j].x)))**  **{**  **++m;**  **float r=(float)(a[t].y-a[j].y)/(a[t].x-a[j].x);**  **z[m]=(int)(r\*(i-a[j].x))+a[j].y;**  **}**  **}**  **//S?p x?p các giao di?m z[] tang d?n theo y**  **for(int j=1;j<=m-1;++j)**  **for (int k=j+1;k<=m;++k)**  **if (z[j]>z[k])**  **swap(z[j],z[k]);**  **//Tô màu các do?n t? giao di?m l? t?i giao di?m ch?n**  **setcolor(14);**  **for (int k=1;k<=m-1;k++)**  **if (k%2!=0) line(i,z[k],i,z[k+1]);**  **}**  **}**  **//--------------------------------**  **main()**  **{**  **int step=5;**  **int x1 = 200, y1 = 100, x2 = 400, y2 = 200, x3 = 250, y3 = 350;**  **char ch;**  **int gd=0,gm;**  **Nhaptoado(P,n);**  **initgraph(&gd,&gm,"");**  **setcolor(9);**  **settextstyle(4,0,4);**  **outtextxy(250,20,"NguyenDucTin");**  **setcolor(5);**  **settextstyle(3,0,5);**  **outtextxy(200,70,"A");**  **settextstyle(3,0,5);**  **outtextxy(420,200,"D");**  **settextstyle(3,0,5);**  **outtextxy(250,360,"C");**  **settextstyle(3,0,5);**  **outtextxy(50,260,"B");**    **Vedagiac(P,n);**  **Tomau(P,n);**  **vehinh(x1, y1, x2, y2, x3, y3);**  **getch();**  **setwritemode(XOR\_PUT);**  **//vehinh(x1, y1, x2, y2, x3, y3);**  **do {**  **ch = getch();**  **switch(ch) {**  **case 72: {**  **vehinh(x1, y1, x2, y2, x3, y3);**  **y1 -= step;**  **y2 -= step;**  **y3 -= step;**  **// y4 -= step;**  **vehinh(x1, y1, x2, y2, x3, y3);**  **break;**  **}**    **case 75: {**  **vehinh(x1, y1, x2, y2, x3, y3);**  **x1 -= step;**  **x2 -= step;**  **x3 -= step;**  **// x4 -= step;**  **vehinh(x1, y1, x2, y2, x3, y3);**  **break;**  **}**    **case 77: {**  **vehinh(x1, y1, x2, y2, x3, y3);**  **x1 += step;**  **x2 += step;**  **x3 += step;**  **//x4 += step;**  **vehinh(x1, y1, x2, y2, x3, y3);**  **break;**  **}**    **case 80: {**  **vehinh(x1, y1, x2, y2, x3, y3);**  **y1 += step;**  **y2 += step;**  **y3 += step;**  **// y4 += step;**  **vehinh(x1, y1, x2, y2, x3, y3);**  **break;**  **}**  **}**  **} while(ch != 27);**  **getch();**  **}**  **/\* z0=50;**  **k0=200;**  **setwritemode(XOR\_PUT);**  **vehinh(z0,k0);**  **do**  **{ ch=getch();**  **switch(ch)**  **{**  **case 75: //phím ?**  **vehinh(z0,k0);**  **z0-=Step;**  **vehinh(z0,k0);**  **break;**  **case 77: //phím ?**  **vehinh(z0,k0);**  **z0+=Step;**  **vehinh(z0,k0);**  **break;**  **case 72: //phím ?**  **vehinh(z0,k0);**  **k0-=Step;**  **vehinh(z0,k0);**  **break;**  **case 80: //phím ?**  **vehinh(z0,k0);**  **k0+=Step;**  **vehinh(z0,k0);**  **break;**  **}**  **} while(ch!=27);**  **closegraph();\*/** |