Программа вычисления абсолютной погрешности функции методом итоговой регистрации на языке Turbo Pascal.

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program itog_pogresh;  {A=(cos(a)+exp(b))/(2*sqr(b)+ln(a))}
  var a,b,da,db,p1,p2,a1,chisl1,  znam2,  itog:real;

function  Dsum(dx,dy:real):real;  {predelnaya absolyutnaya pogreshnost summi}
   begin  Dsum:=dx+dy  end;

function  Dquot(x,y:real;  dx,dy:real):real;  {predelnaya absolyutnaya pogreshnost chasnogo}      begin
Dquot:=(abs(x)*dy+abs(y)*dx)/sqr(y)  end;

function  Dmult(x:real;  dx:real):real;  {predelnaya absolyutnaya pogrsehnost proizvedeniya}      begin
Dmult:=2*abs(x)*dx  end;

function  Dln(x,dx:real):real;  {predelnaya absolyutnaya pogreshnost naturalnogo
logarifma}        begin Dln:=dx/x  end;

function  Dexp(x,dx:real):real;
 begin Dexp:=dx*exp(x)  end;
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function Dsqrt(x,dx:real):real; {predelnaya absolyutnaya porshnost kvadratnogo kornya}  begin
Dsqrt:=dx/(2*sqrt(x)) end;

function Dsqr(x,dx:real):real; {predelnaya absolyutnaya pogrshnost kvadrata}

   begin Dsqr:=(2*(x))*dx end;

function Dsin(x,dx:real):real; {predelnaya absolyutnaya pogrshnost sin}
   begin Dsin:=abs(cos(x))*dx; end;

function Dcos(x,dx:real):real; {predelnaya absolyutnaya pogrshnost cos}
   begin Dcos:=abs(sin(x))*dx; end;

function Dtg(x,dx:real):real; {predelnaya absolyutnaya pogrshnost tg}
   begin Dtg:=dx/sqr(x); end;
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function Darcsin(x,dx:real):real; {predelnaya absolyutnaya pogrshnost arcsin}
  begin Darcsin:=dx/(sqrt(1-sqr(x))); end;

function Darccos(x,dx:real):real; {predelnaya absolyutnaya pogrshnost arccos}
  begin Darccos:=dx/(sqrt(1-sqr(x))); end;

function Darctg(x,dx:real):real; {predelnaya absolyutnaya pogrshnost arctg}
  begin Darctg:=dx/(1+sqr(x)); end;

function D1_del_x(x,dx:real):real; {predelnaya absolyutnaya pogrshnost 1/x}
  begin D1_del_x:=dx/(sqr(x)); end;
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```
begin
 Write('Vvedite sledujushie chisla'); readln;
 write('a='); readln(a);
 write('b='); readln(b);
 write('da='); readln(da);
 write('db='); readln(db);

 p1:=cos(a)+exp(b);  {chislitel}
 p2:=2*sqr(b)+ln(a);  {znamenatel}
 a1:=p1/p2;

 chisl1:=Dsum(Dexp(b,db),Dcos(a,da));{predelnaya absolyutnaya pogreshnost
                                      chislitelya}
 znam2:=Dsum((2*dsqr(b,db)),dln(a,da));{predelnaya absolyutnaya pogreshnost
                                        znamenatelya}
 itog:=Dquot(p1,p2,  chisl1,znam2);
 writeln('chislo  a=',a1:5:4);
 writeln('predelnaya absolyutnaya pogreshnost=',itog:5:4);
 readln;
 end.
```

```
program granitsi;  {poshagovii vivod znachenii granits v protsesse
                    vichislenii po formule A=(cos(a)+exp(b))/(2*sqr(b)+ln(a))}
     var a,b,da,db,nga,vga,ngb,vgb,lsum,upsum,lmult,upmult,
         lsum2,aa,upsum2,  lquot,upquot,r:real;  n:integer;

 {verhnyaya i nijnyaya granitsi pogreshnosti summi}
procedure sum(la,upa,lb,upb:real;  var ls,ups:real);
  begin ls:=la+lb;  ups:=upa+upb  end;

 {verhnyaya i nijnyaya pogreshnosti proizvedeniya}
procedure mult(la,upa:real;  var lm,upm:real);
  begin lm:=sqr(la);upm:=sqr(upa);   end;

 {verhnyaya i nijnyaya pogreshnosti chastnogo}
procedure quot(la,upa,lb,upb:real;  var lq,upq:real);
  begin lq:=la/upb;  upq:=upa/lb;   end;
```

```
begin
 Writeln('Vvedite  sledujushie  chisla');
 write('a=');  readln(a);
 write('b=');  readln(b);
 write('da=');  readln(da);
 write('db=');  readln(db);  writeln;
  nga:=a-da;  vga:=a+da;  writeln(nga:10:4,'<  a <',vga:10:4);
  ngb:=b-db;  vgb:=b+db;  writeln(ngb:10:4,'<  b <',vgb:10:4);

 writeln('nijnyaya  granitsa  e^b=',exp(ngb));
 writeln('verhnyaya  granitsa  e^b=',exp(vgb));  writeln;
 writeln('nijnyaya  granitsa  cos(a)=',cos(nga));
 writeln('verhnyaya  granitsa  cos(a)=',cos(vga));
 writeln('nijnyaya  granitsa  2*sqrt(b)=',2*sqrt(ngb));
 writeln('verhnyaya  granitsa  2*sqrt(b)=',2*sqrt(vgb));
 writeln('nijnyaya  granitsa  ln(a)=',ln(nga));
 writeln('verhnyaya  granitsa  ln(a)=',ln(vga));  writeln;
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```
sum(cos(nga),cos(vga),exp(ngb),exp(vgb),lsum,upsum);
 writeln('nijnyaya  granitsa  cos(a)+exp(b)=',lsum);
 writeln('verhnyaya  granitsa  cos(a)+exp(b)=',upsum);  writeln;

mult(ngb,vgb,lmult,upmult);  writeln;
 writeln('nijnyaya  granitsa  b^2=',lmult);
 writeln('verhnyaya  granitsa  b^2=',upmult);  writeln;

sum(ln(nga),ln(vga),2*lmult,2*upmult,lsum2,upsum2);
 writeln('nijnyaya  granitsa  2*b^2+ln(a)=',lsum2);
 writeln('verhnyaya  granitsa  2*b^2+ln(a)=',upsum2);  writeln;

quot(lsum,upsum,lsum2,upsum2,lquot,upquot);
 aa:=(lquot+upquot)/2;  writeln('A=',aa:6:4);
 writeln('nijnyaya  granitsa  A=',lquot:6:4);
 writeln('verhnyaya  granitsa  A=',upquot:6:4);
 writeln('absolyutnaya  pogreshnost  A=',abs(upquot-lquot)/2:6:4);
 writeln;
repeat until  keypressed;  end.
```

1.7. Задания для лабораторных работ. Вычислить абсолютную погрешность по методам итоговой регистрации погрешностей и границ

№	a	b	Δa	Δb	A
1	5	4	0.001	0.002	$\frac{\cos(a+b^2)-\ln(b+\sqrt{a})}{2b^3-4a^{(5/3)}-1}$
2	3	2	0.0005	0.0005	$\frac{\sin(b^2-3a+ab)+e^{2b}}{\ln(a^3+b)}$
3	2.1	3.9	0.001	0.003	$\frac{e^{3a}+\ln(\sqrt{a}+b^2)}{\sin(2a^2-b)}$
4	3	6	0.0006	0.0005	$\frac{\sin(2b^3-7a)-\cos(2a+b)}{\ln(b^2+a^2)}$
5	4	6	0.0004	0.002	$\frac{ab}{\sqrt{a+b^2}}$
6	0.3	3.2	0.0006	0.0007	$\frac{a+\sqrt{b}}{\lg(a^2+b^2)}$

7	1.7	1.2	0.0005	0.0006	$\frac{e^a - \sqrt[3]{b}}{\ln(1+a^2)}$
8	7	3	0.002	0.003	$\lg\frac{\cos^2 a + b}{a^{\sqrt{b}} + b^{\sqrt{a}}}$
9	6.5	3.5	0.0004	0.0004	$\ln(a-b)(a+\sin b)+e^{2a}$
10	7	2	0.0005	0.0007	$10a(b^2+\ln a)+(a-b^2)$
11	2	1	0.0002	0.0003	$(\sin(ab+a^2)-e^{\sqrt{b}})(\lg(a-b)+3a^3)$
12	4	3	0.0001	0.0002	$e^a \ln(a+b^2)+e^b \sin(2a^2-3b^3)$
13	1	4	0.0004	0.0005	$\sqrt{ab}-(e^a+3\sqrt{b})\cos(b^2-3a)$
14	5	5	0.001	0.002	$\sqrt{ab}\ln a \ln b + e^{2a}\sin b$