```
> with(geometry);with(plots);Digits:=30;_EnvHorizontalName := x;
  _EnvVerticalName := y;
```

[*Apollonius, AreCollinear, AreConcurrent, AreConcyclic, AreConjugate, AreHarmonic,*

    AreOrthogonal, AreParallel, ArePerpendicular, AreSimilar, AreTangent, CircleOfSimilitude,

    CrossProduct, CrossRatio, DefinedAs, Equation, EulerCircle, EulerLine, ExteriorAngle,

    ExternalBisector, FindAngle, GergonnePoint, GlideReflection, HorizontalCoord, HorizontalName,

    InteriorAngle, IsEquilateral, IsOnCircle, IsOnLine, IsRightTriangle, MajorAxis, MakeSquare,

    MinorAxis, NagelPoint, OnSegment, ParallelLine, PedalTriangle, PerpenBisector,

    PerpendicularLine, Polar, Pole, RadicalAxis, RadicalCenter, RegularPolygon,

    RegularStarPolygon, SensedMagnitude, SimsonLine, SpiralRotation, StretchReflection,

    StretchRotation, TangentLine, VerticalCoord, VerticalName, altitude, apothem, area, asymptotes,

    bisector, center, centroid, circle, circumcircle, conic, convexhull, coordinates, detail, diagonal,

    diameter, dilatation, directrix, distance, draw, dsegment, ellipse, excircle, expansion, foci, focus,

    form, homology, homothety, hyperbola, incircle, inradius, intersection, inversion, line, medial,

    median, method, midpoint, orthocenter, parabola, perimeter, point, powerpc, projection, radius,

    randpoint, reciprocation, reflection, rotation, segment, sides, similitude, slope, square, stretch,

    tangentpc, translation, triangle, vertex, vertices]

[*animate, animate3d, animatecurve, arrow, changecoords, complexplot, complexplot3d, conformal,*

    conformal3d, contourplot, contourplot3d, coordplot, coordplot3d, cylinderplot, densityplot,

    display, display3d, fieldplot, fieldplot3d, gradplot, gradplot3d, graphplot3d, implicitplot,

    implicitplot3d, inequal, interactive, listcontplot, listcontplot3d, listdensityplot, listplot, listplot3d,

    loglogplot, logplot, matrixplot, odeplot, pareto, plotcompare, pointplot, pointplot3d, polarplot,

    polygonplot, polygonplot3d, polyhedra_supported, polyhedraplot, replot, rootlocus, semilogplot,

    setoptions, setoptions3d, spacecurve, sparsematrixplot, sphereplot, surfdata, textplot, textplot3d,

    tubeplot]

$$Digits := 30$$

$$\_EnvHorizontalName := x$$

$$\_EnvVerticalName := y$$

```
> distancia := proc( i )
>   local r, s, t; global p4;
>
>   r := (c_a*clave)/(clave-i*c_a);
>   s := -(r - raiz);
>   t := ((s*clave)-(c_a*clave))/(c_a*s);
>   s := (c_a*clave)/(clave-t*c_a);
>   p4 := round(t);
>
>   point(P1,[i,r]):
>   point(P2,[t,s]):
>
```

```
>     return distance(P1,P2);
>
> end proc:
>
> lower := proc( left, right )
>    local l, m_1, m, m1, r, new_left, middle, new_right, diff,
>  divisor;
>
>    new_left := left;
>    new_right:= right;
>    diff := new_right - new_left;
>    divisor := div;
>
>    if( diff < 4 ) then
>      new_right := right + (4-diff);
>      diff := new_right - new_left;
>    end if;
>
>    middle := ceil( new_left+((new_right-new_left)/2) );
>
>    l  := distancia( new_left );
>    m_1:= distancia( middle-1 );
>    m  := distancia( middle );
>    m1 := distancia( middle+1 );
>    r  := distancia( new_right );
>
>    if( diff = 4 ) then
>      if( l < m_1 ) then
>        return [new_left,l];
>      elif( m_1 < m ) then
>        return [middle-1,m_1];
>      elif( m < m1 ) then
>        return [middle,m];
>      elif( m1 < r ) then
>        return [middle+1,m1]
>      else
>        return [new_right,r];
>      end if;
>    elif( (l < m_1) or (m_1 < m) ) then
>      new_right:= middle-1;
>      return lower( new_left, new_right );
>    elif( (m_1 > m) and (m < m1) ) then
>      return [middle,m];
>    elif( (m > m1) and ( (m1 < r) or ( r < m1) ) ) then
>      new_left := middle+1;
>      return lower( new_left, new_right );
>    end if;
>
> end proc:
```

```
[ >
[ > higher := proc( i )
  >    local p1, p2, p3;
  >    p1 := distancia( i-1 );
  >    p2 := distancia( i );
  >    p3 := distancia( i+1 );
  >    if( (p1 > p2) and (p1 > p3) ) then
  >       return [i-1,p1];
  >    elif( (p2 > p1) and (p2 > p3) ) then
  >       return [i,p2];
  >    else return [i+1,p3];
  >    end if;
[ > end proc:
[ >
[ > ask_one := proc( low, up, div )
  >    local res, l, u;
  >
  >    l := distancia( low );
  >    u := distancia( up );
  >
  >    if( l < u ) then
  >       res := evalf(u/l);
  >    else
  >       res := evalf(l/u);
  >    end if;
  >
  >    return res;
  >
[ > end proc:
[ >
[ > tanto13 := proc( p1, p2, p3 )
  >    local d1, d2, t, i, low_below, low_over, div, low_div, over_div,
     top, temp;
  >    global clave, raiz, a, c_a;
  >    clave := p1 * p2;
  >    raiz := evalf(sqrt(clave));
  >
  >    print(p1,p2,clave,raiz);
  >
  >    a  := evalf( clave / ( clave - raiz ) );
  >    c_a:= a * raiz;
  >
  >    # Original Triangle T1
  >
  >    low_below := [p1-1,distancia( p1-1 )];
  >    top       := higher( trunc( raiz ) );
  >    low_over  := [p2-1,distancia( p2-1 )];
  >
  >    point( PT1, low_below );
```

```
>    point( PT2, top );
>    point( PT3, low_over );
>
>    triangle( T1, [PT1,PT2,PT3] );
>
>    centroid( C1, T1 );
>    orthocenter( O1, T1 );
>
>    incircle( inc1, T1 );
>    print( "incircle center", coordinates( center( inc1 ) ) );
>    print( "incircle radius", radius( inc1 ) );
>
>    circumcircle( circ1, T1, 'centername'=0 );
>    print( "circumcircle center", coordinates( center( circ1 ) ) );
>    print( " circumcircle radius", radius( circ1 ) );
>
>    print( low_below );
>    print( top );
>    print( low_over );
>    print( abs( low_below[2]-low_over[2] ) );
>
>    print( area( T1 ) );
>    print( coordinates( C1 ) );
>    print( coordinates( O1 ) );
>
>    printf("\n");
>
>    # Guess Triangle T2
>
>
>    low_below := [p3-1,distancia( p3-1 )];
>    div        := p4;
>    top        := higher( trunc(raiz) );
>    low_over   := [div,distancia( div )];
>
>    if( low_below[2] > low_over[2] ) then
>      temp := low_below[2];
>      low_below[2] := low_over[2];
>      low_over[2] := temp;
>    end if;
>
>    point( P4, low_below );
>    point( P5, top );
>    point( P6, low_over );
>    triangle( T2, [P4,P5,P6] );
>
>    centroid( C2, T2 );
>    orthocenter( O2, T2 );
>
```

```
>    incircle( inc2, T2,'centername'=o );
>    print( "incircle center", coordinates( center( inc2 ) ) );
>    print( "incircle radius", radius( inc2 ) );
>
>    circumcircle( circ2, T2, 'centername'=0 );
>    print( "circumcircle center", coordinates( center( circ2 ) ) );
>    print( "circumcircle radius", radius( circ2 ) );
>
>    line( ref, y=VerticalCoord(C2),[x,y] );
>    reflection( T3, T2, ref );
>
>    print( p3-1, div );
>    print( low_below );
>    print( top );
>    print( low_over );
>    print( abs( low_below[2]-low_over[2] ) );
>
>    print( area( T2 ) );
>    print( coordinates( C2 ) );
>    print( coordinates( O2 ) );
>
> #  printf("\n");
> #
> #  div := 2;
> #  low_below := lower( 1, trunc(raiz), div );
> #  low_over  := lower( trunc(raiz), clave, div );
> #  low_div := distancia( low_below[1], 1 );
> #  over_div:= distancia( low_over[1], 1 );
> #  print( div );
> #  print( low_below, low_div  );
> #  print( low_over, over_div );
> #  print( abs( low_below[2]-low_over[2] ), abs( low_div-over_div)
  );
> #
> #  printf("\n");
> #
> #  div := 0.5;
> #  low_below := lower( 1, trunc(raiz), div );
> #  low_over  := lower( trunc(raiz), clave, div );
> #  low_div := distancia( low_below[1], 1 );
> #  over_div:= distancia( low_over[1], 1 );
> #  print( div );
> #  print( low_below, low_div  );
> #  print( low_over, over_div );
> #  print( abs( low_below[2]-low_over[2] ), abs( low_div-over_div)
  );
> #
>    printf("\n");
>
```

```
> #  div := p3;
> #  low_below := lower( 1, trunc(raiz), div );
> #  low_over  := lower( trunc(raiz), clave, div );
> #  low_div := distancia( low_below[1], 1 );
> #  over_div:= distancia( low_over[1], 1 );
> #  print( div );
> #  print( low_below, low_div  );
> #  print( low_over, over_div );
>
> draw( [T1(colour=green), T2(colour=red), C1(colour=green),
  C2(colour=red), O1(colour=magenta), O2(colour=black)],
  axes=normal, scaling=unconstrained );
>
> end proc:
>
> p1:=3;p2:=11;p3:=1;tanto13(p1,p2,p3);
```

$$p1 := 3$$

$$p2 := 11$$

$$p3 := 1$$

$$3, 11, 33, 5.744562646538028659850611146822$$

"incircle center", [5.983618994870454250300550855433, 23.909936464159159167491193707S]

"incircle radius", 3.934970971853907689235142368S7

"circumcircle center",

[6.0000000000000000000000000000220, 142.019471047614327540833507142]

" circumcircle radius", 122.1100378193368177309805348S7

[2, 19.9749654923052514782560513392]

[5, 264.125414130823295189417437639]

[10, 19.9749654923052514782560513392]

0.

976.601794554072174844645545200

$$\left[\frac{17}{3}, 101.358448371811266048643180106 \right]$$

[4.999999999999999999999999999, 20.0364030202051430642625260317]

"incircle center", [15.241094327789419869052427749S2, 47.940432640337720717823794454S2]

"incircle radius", 14.914909881806252564712341294S0

"circumcircle center",

[15.99999999999999999999999999984, 148.283386957320641855976182769]

"circumcircle radius", 116.363118124543771328988895931

0, 32

[0, 33.0255227585314681531114531599]

$$[5, 264.12541413082329518941 7437639]$$
$$[32, 33.02552275853146815311 14531602]$$
$$0.3 \ 10^{-27}$$
$$3697.59826195666923258089575166$$
$$\left[\frac{37}{3}, 110.05881988262874383188 0114653\right]$$
$$[5.0000000000000000000000000198, 33.6096857332449477836879784209]$$


```
> 
> p1:=23;p2:=61;p3:=1;tanto13(p1,p2,p3);
```
$$p1 := 23$$
$$p2 := 61$$
$$p3 := 1$$
$$23, 61, 1403, 37.45664160065608444 72448586154$$
"incircle center", $[40.98402355592626257272 74170130, 180.12375222685154869 0140633169]$
"incircle radius", $18.9393795015149225211 2952026$
"circumcircle center",
$\quad [41.00000000000000000000000 02064, 3134.26706353199391422 919174170]$

" circumcircle radius", 2973.143401582600268448903053711

[22, 161.184372725336399464929337969]

[36, 6107.40626080718289310952758531]

[60, 161.184372725336399464929337966]

$0.3 \cdot 10^{-26}$

112978.21587355508337924736670000

$$\left[\frac{118}{3}, 2143.2583354192852306797954204 2 \right]$$

[35.99999999999999999999995363, 161.24087919386786358100277784 7]

"incircle center", [603.9240205382427797039985065 70, 2001.877317541913009235349520 34]

"incircle radius", 599.3206667309310727266971296 21

"circumcircle center",

[700.99999999999999999999999630, 3749.755358900956194347611304 60]

"circumcircle radius", 2449.641356455929078318914230 49

0, 1402

[0, 1402.556650810981936508652390 61]

[36, 6107.40626080718289310952758531]

[1402, 1402.556650810981936508652390 84]

$0.23 \cdot 10^{-24}$

$0.329809957660733687057721351148 \cdot 10^{7}$

$$\left[\frac{1438}{3}, 2970.839854143048922042277455 59 \right]$$

[36.00000000000000000000007480, 1413.008844627243774316097575 7]
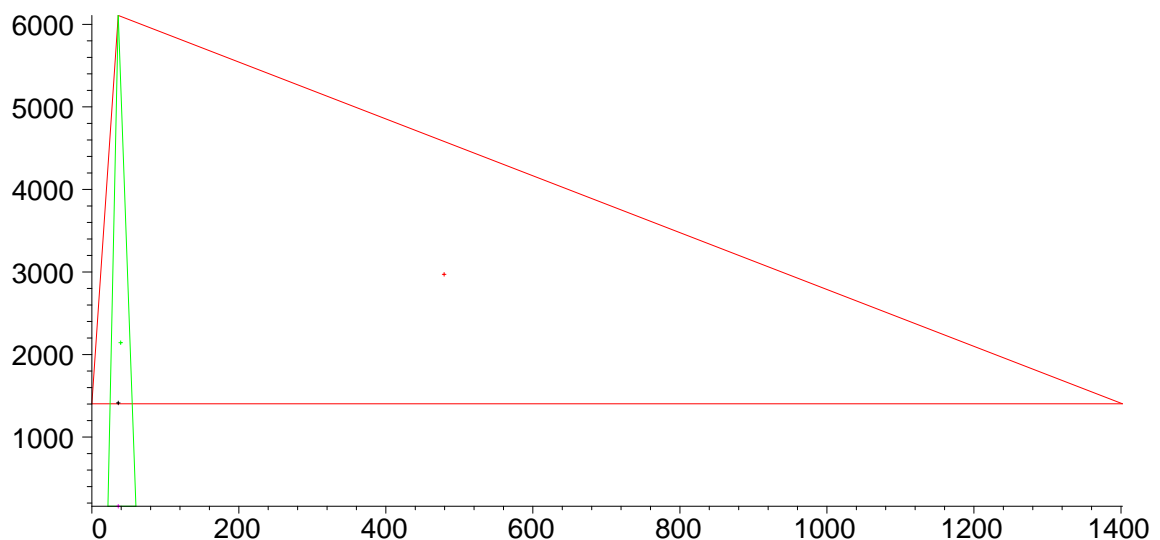
> `p1:=51;p2:=101;p3:=1;tanto13(p1,p2,p3);detail(T3);`

$$p1 := 51$$
$$p2 := 101$$
$$p3 := 1$$

$$51, 101, 5151, 71.77046746399245796123215246111$$

"incircle center", $[74.99775417893830597845624208931, 452.14459474422719114482624829611]$

"incircle radius", $24.985967455735548870406269982511$

"circumcircle center",

$[75.00000000000000000000004213511, 22690.72067689779274044447977865]$

" circumcircle radius", $22263.576085993092408376471940311$

$[50, 427.1586272884916422744199783171]$

$[71, 44954.296403559570464266866266011]$

$[100, 427.1586272884916422744199783071]$

$$0.10 \cdot 10^{-25}$$

$$0.1113178444406776970549811157191 \cdot 10^{7}$$

$$\left[\frac{221}{3}, 15269.537886045517916271902074211\right]$$

$[70.99999999999999999999999119611, 427.1723043409682679267466662201]$

"incircle center", $[2413.664502952694346215147066121, 7559.891702177332121555357669211]$

"incircle radius", $2409.362966967069513632884129491$

"circumcircle center",

$[2574.99999999999999999999997301, 25047.88273483300560464660112321]$

"circumcircle radius", $20063.282911038751233209121791411$

$$0, 5150$$

$[0, 5150.528735210663698522651637141]$

$[71, 44954.296403559570464266866266011]$

$[5150, 5150.528735210663698522651637811]$

$$0.67 \cdot 10^{-24}$$

$$0.1024947017459984349217913526701 \cdot 10^{9}$$

$$\left[\frac{5221}{3}, 18418.451291326965953770723180311\right]$$

$[71.00000000000000000000000540481, 5159.588405214886652018967294471]$

```
> p1:=101;p2:=103;p3:=1;tanto13(p1,p2,p3);
```

$$p1 := 101$$

$$p2 := 103$$

$$p3 := 1$$

101, 103, 10403, 101.9950979214197332948235297

"incircle center", [101., 20807.50008387185625793611639556]

"incircle radius", 0.9999997623616400924602004189890

"circumcircle center",

[101.00000000000000000000786791, 0.2132615251267426129147076494910^7]

" circumcircle radius", 0.2111808751183554272917168944419 10^7

[100, 20806.5000841086200939268703764]

[101, 0.424442400245098040206424544184 10^7]

[102, 20806.5000841086200939268703764]

0.

0.422361750236687178197031857146 10^7

[101, 0.142867900087306588075069972753 10^7]

[101.00000000000000000000832980, 20806.5000843453839579461880061]

"incircle center", [5194.73525598403283408779197215, 15597.1313762314957371504166626]

"incircle radius", 5194.61134022091902487711646765

"circumcircle center",

[5200.9999999999999999999971360, 0.212741313838145944150030905692 10^7]

"circumcircle radius", 0.211701700715614936072159488515 10^7

0, 10402

[0, 10402.5200360105767122733001942]

[101, 0.424442400245098040206424544184 10^7]

[10402, 10402.5200360105767122733001956]

0.14 10^{-23}

0.220211457300402580616556071087 10^{11}

[3501, 0.142174301417433385182959734741 10^7]

[101.00000000000000000000564848, 10402.7657600826724881739283824]

```
> p1:=nextprime(45);p2:=nextprime(60);p3:=1;tanto13(p1,p2,p3);
```

$$p1 := 47$$

$$p2 := 61$$

$$p3 := 1$$

47, 61, 2867, 53.544374120910219114530304469

"incircle center", [52.99999999999999999999999, 829.74300489849531712428498205050]

"incircle radius", 6.9958541980153473147322011795052

"circumcircle center",

[52.99999999999999999999981175, 6730.5869828287934210347259944040]

" circumcircle radius", 5907.8439791587166507711025876

[46, 822.7471507004799698095527780840]

[53, 12638.4309619875100718058285932]

[60, 822.7471507004799698095527780888]

$0.48 \ 10^{-25}$

82709.7866790092107139739306870

[53, 4761.308421129490003808311384497]

[53.0000000000000000000000365101, 822.7512977308831693554482166098]

"incircle center", [1234.658458917894435218621344149, 4094.5191023971165445435694562]

"incircle radius", 1227.980177609302166424254423049

"circumcircle center",

[1432.99999999999999999999974, 7744.8564821156302514892134175]

"circumcircle radius", 5084.434205550341527051633697785

0, 2866

[0, 2866.538924787814378130102271507]

[53, 12638.4309619875100718058285932]

[2866, 2866.538924787814378130102271521]

$0.14 \ 10^{-24}$

$0.14003121289307163929037315834 \ 10^{8}$

[973, 6123.836270521046276022011134117]

[53.0000000000000000000000005272, 2881.795847340012777768819134000]
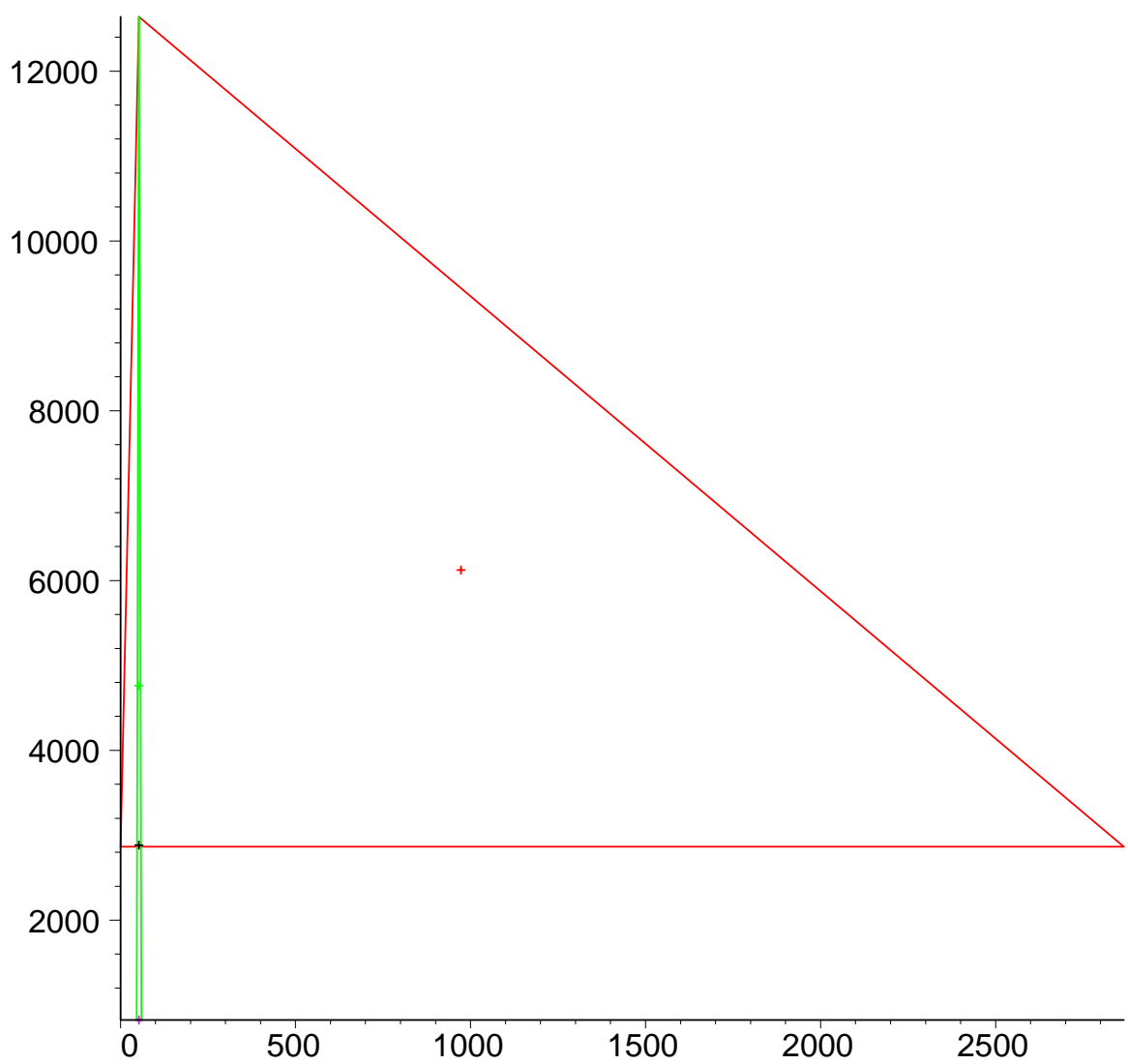
> p1:=1237;p2:=9743;p3:=1;tanto13(p1,p2,p3);

$p1 := 1237$

$p2 := 9743$

$p3 := 1$

1237, 9743, 12052091, 3471.6121615180460708052618591

"incircle center", [5488.8618887093445086358091520305, 15471.583291383509344009700634575]

"incircle radius", 4252.7089337238395335886735047

"circumcircle center",

[5488.99999999999999999996200, 0.31082371361206196200823722618 10^8]

" circumcircle radius", $0.3107115277792253069540784844467 \ 10^8$

$[1236, 11218.87435765966981045083328840]$

$[3471, 0.62153524073596494580923894952 \ 10^8]$

$[9742, 11218.87435765966981045083328840]$

$0.$

$0.2642912240123627648769654778840 \ 10^{12}$

$\left[\dfrac{14449}{3}, 0.2072532060743272713068482655397 \ 10^8 \right]$

$[3471.000000000000000000000002, 11219.0998994215188973513817607]$

"incircle center",

$[0.5311849340086027611018544894\mathbf{0}2 \ 10^7, 0.1736357185138400548934793480\mathbf{5} \ 10^8]$

"incircle radius", $0.5311481350807536154493213460\mathbf{2}4 \ 10^7$

"circumcircle center",

$[0.6026044999999999999997055 \ 10^7, 0.3710238992620909013521771524\mathbf{5}2 \ 10^8]$

"circumcircle radius", $0.2576491256837242324054896740\mathbf{0}1 \ 10^8$

$0, 12052090$

$[0, 0.1205209050057646439444158001\mathbf{4}0 \ 10^8]$

$[3471, 0.62153524073596494580923894952\mathbf{6} \ 10^8]$

$[12052090, 0.1205209050057646439444158002\mathbf{8}2 \ 10^8]$

$0.142 \ 10^{-19}$

$0.30191349327552948780510082152\mathbf{4} \ 10^{15}$

$\left[\dfrac{12055561}{3}, 0.2875256835824980778993568499\mathbf{8}3 \ 10^8 \right]$

$[3471.0000000000000000005895228, 0.1205292522233124309937162450\mathbf{4}4 \ 10^8]$
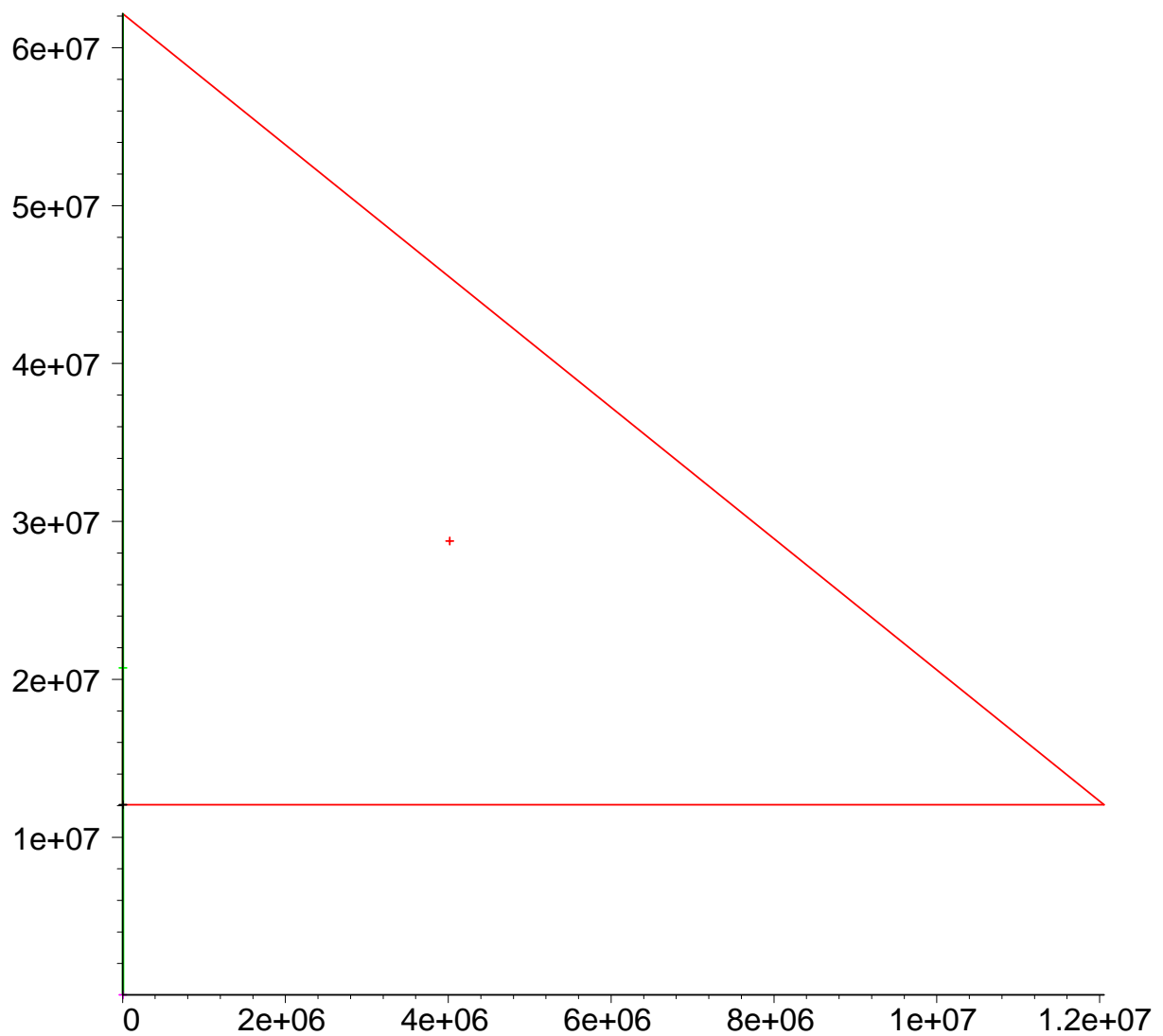
```
> Digits:=100;p1:=nextprime(3453545355735747686783446427);p2:=nextp
  rime(6574853557357476867834464267);p3:=345354535573574768678344642
  73;tanto13(p1,p2,p3);
```

$$Digits := 100$$

$$p1 := 3453545355735747686783446273$$

$$p2 := 6574853557357476867834464297$$

$$p3 := 3453545355735747686783446273$$

3453545355735747686783446273, 6574853557357476867834464297,

227065549676545736071953404916578362536146720832940561081, 0.15068694358720\

8555496349318213817235512271380385829878862240300216313561122375253986222\

$$2099727851708\ 10^{29}$$

"incircle center", [0.205551535573574768678344642839355272260220352311432183175\
27260877353138585168429809703200823046544452 10^{29}, 0.614791723239362961808263\
22239888554513721905205651983050588067461892498694576798356347736659438870\
299 10^{29}]

"incircle radius", 0.139802999999999999999999878357139478467050371446438347\
156112576048335442203837139423929706611638 10^{29}

"circumcircle center", [0.205551535573574768678344642840000000000000000000000\
00000000000000000008435171372114471102862840544 10^{29}, 0.59484291432003964368\
52576667953553058481791721895627847703251426864904426664251880172781458 0\
3861820 10^{57}]

" circumcircle radius", 0.59484291432003964368525766674785643352424287600873646 2\
5184365881727685374589905357511405637378919688 10^{57}

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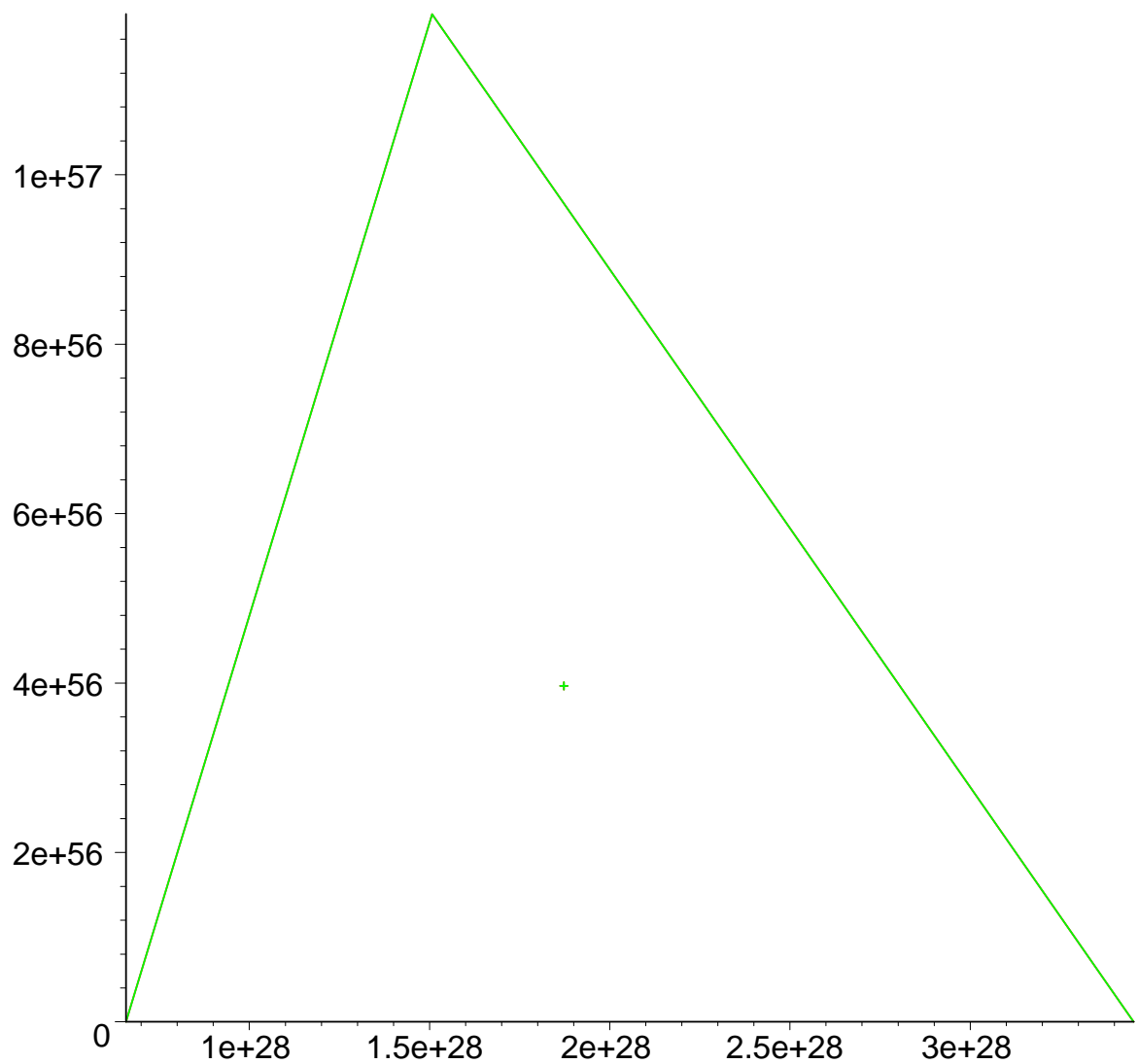
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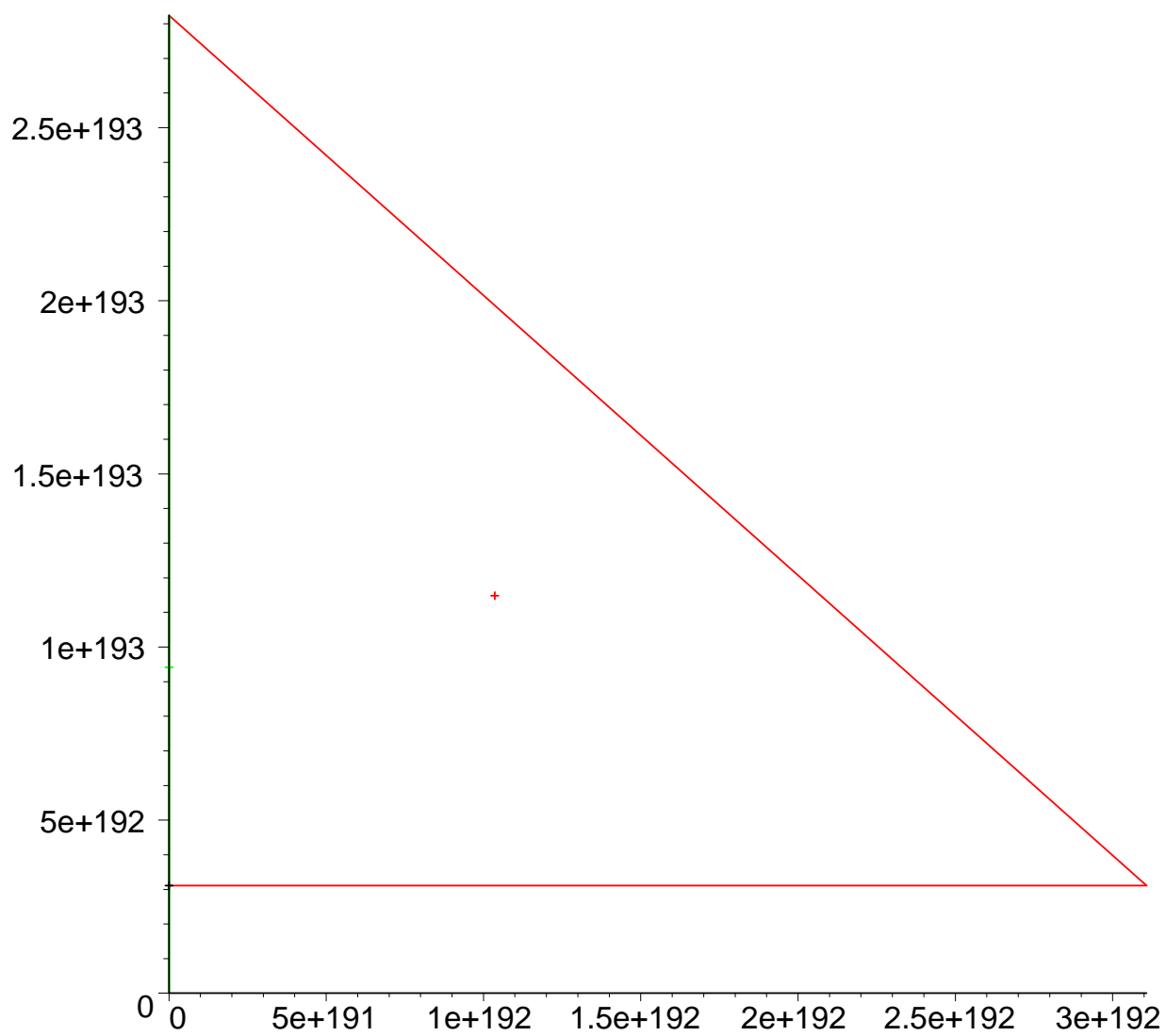   3100104508151212118167511579

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