[Note: These verses were composed circa 1982, to aid 'writer's mind' through a college algebra course. Since the author has forgotten most of what was studied, and because the text since has been through retyping, error in transcription may have occurred. Should a reader find a typographical error, the author would be thrilled to be so informed!]

INTERMEDIATE ALGEBRA

Chapter Seven

A Student's Rhyme

This is the ordered chorus of Cardano and Pythagorus--
a counterpoint Cartesian of in-ordinate absciss-i-on….

Canto I

Ours is a world that does not lie,
and any *x* can show you why
it first cannot function without negation
in more than one pair in any relation.

***Y*'s have ranges; *x*'s, domains;**
neither ever over the other reigns.
Rectangularly coordinated they find their fun
in graphic mazes of rise over run.

Their involvements are implicit;
their expressions, explicit.
Thus logically are they opposed
to equations illicit.

***X*'s and *y*'s sing their linear quatrain**
while traveling along a bisected plane
properly conceived as a tiled floor
divided into regions , four.

Though their tracks can go in any direction,
it will be observed upon close inspection
there are only four routes that they may practice,
and each is relative to their axes.

Moving up diagonally from left to right
on either side is a 'positive' flight.
It follows right-to-left downward they drive,
whenever they take a 'negative' dive.

**Occasionally one chooses to travel alone
on one of the roads running straight through its home;
and an *x* who alone has wined and dined
slopes along ‘undefined,’
while a *y* who has chosen to behave as Nero
inherits a slope equal to zero.**

Canto II

**It’s when *x’*s and *y*’s play with inequalities
that they engage in the greatest frivolities.
The system’s the same, but watch for the signs!--
which may or may not include the lines.
And, before you shade the origin blue,
if the variables are zero is the statement true?**

**Their intercepts are freed for all to see
by “*y* equals *m x* plus *b*.”
And once you’ve found the point there’s hope
you’ll have no problem finding slope,
by taking *y 2 y 1* to start
then dividing by the *x*’s counterpart.**

**In spite of how segmented they appear,
you can plot their distances from there to here
by taking the square root of the sum of squares
of *x’*s and *y*’s in differencing pairs.**

Finally…

**For converting a set to the standard equation,[1]
the point-slope formula deserves an ovation.
Take *y* less a *y 1* equaled to
m, times *x* minus *x 1* too.**

**(If there’s more of our world you’d like to know,
be certain to catch the very next show.
If we haven’t yet, we’ll surely win your affections
with vertices, asymptotes, and conic sections….)**

Canto III

**Upon first observation of equations quadratic
the variables appear extremely erratic.
We *x’*s and *y*’s now travel in curves, but**

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[1] $ax + by + c = 0$

our antics are more than just casual swerves.
Like the *x'*s and *y'*s that cause procreation
we also produce, through association,
definite forms that depend on what's shared.
One, the other, or both are squared.

$Y = ax^2 + bx + c$
yields a parabola naturally.
If *a*'s greater than zero the curve opens uptown;
but if *a* is negative, the curve's turned upside down.

The 'floor' of the former is like the base of a vase—
technically, the minimum point in every such case.
And while the upside-down one has a definite 'ceiling,'
"maximum point" is the term most appealing.

$X = ay^2 + by = c$
also yields parabolas consistently,
which open outward in a right or left bay,
respectively, with positive or negative *a.*

Beginning with forms which, upon inspection,
reveal their graphs with minimal reflection,
$y = 4x^2$ **is most sufficient**
to learn the importance of the *x*-coefficient.

Let the *x* equal positive or negative 1,
then *y* equals 4 and the task is near done.
Since if *x* equaled 0 the origin's the 'floor,'
step one to each side and go up four.
If it's a negative 4 with which you are dealing,
step over and down, and zero's the 'ceiling.'

$y = 4x^2 + 4$
is the same equation with a little more,
except the ceiling or floor will be moved in this practice,
by the constant's value, up or down the *y* axis.

Perhaps an example in terms of sex
will help define the 'function' of *x,*
who either slightly promiscuous or chastely shy,
associates with two or only one *y.*

When a parabola lies in a sideways state,
all or most of its *x*'s have more than one mate.
Customarily it's said in this situation
that *x'*s involvement is just a relation.

But when a parabola opens upward or down
it's *x'*s upon loose behavior frown.
They function truly, and that is why
each will associate with only one *y.*

Thus the 'function of *x'* easily is shown
by a perpendicular line from an *x'*s home
directed lengthwise to the coordinate
which is the *x'*s proper ordinate.
Simply stated the function of *x* will be
the number of steps taken vertically.

CANTO IV

Now let us commence to carry through
the entire process held in view,
to which we will add, as we proceed,
a few refinements we definitely need.

So consider, then, for *y'*s equality:
$-2x^2 - 5x + 3.$[2]
1. Finding the *y* intercept,
 and assigning 0 to each *x,*
 immediately yields 3
 as the *y* intercept.

2. Factor the left member to provide
 two of the points where *x'*s reside.[3]
 But it's not possible yet to guarantee
 where the crucial "vertex point" will be!

3. So rewrite the formula another way:
 $y = z(x-h)^2 + k.$
 Still, before reaching the shortcut there,

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[2] $y = -2x^2 - 5x + 3$
[3] Factoring the left-hand member:
$-2x^2 - 5x + 3 = 0;$
$-1 (x + 3) (2x – 1) = 0;$
either $(x + 3) = 0, x = -3,$
or $(2x – 1) = 0, x = l/2.$
Or in the case of $f(x) = x^2 - 4x:$
$x (x – 4)$
$x = 0$ or $4.$

you'll need to know how to complete the square. [4]

With the figures of completion take careful action:
when is it addition and when, subtraction?
For the ultimate aim that this is about
is that one act cancel the other out.

> **(You'll be able to understand considerably more**
> **if you compare footnote 6 with this one before:**[5]**)**

Now the part in parentheses and the value of *k*
give the maximum or minimum points away.[6]
Together with the intercepts found previously
the graph then can be completed easily.[7]

Canto V

By this time you're thinking, *Stop! That's enough!*
But one final tip will help show your stuff.
The altered formula also conceals
two boiled-down factors; and each reveals
with practically no work or fuss
the points we've gone such lengths to discuss.

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[4] **Complete the square:**

$y = -2x_2 – 5x + 3$

$y = -2 (x – 5/2 +) + 3$

$y = -2 (x – 5/2 + 25/16) + 3 + 2(25/16)$

$y = - 2 (x – 5/4)_2 + 48/16 + 50/16$

$y = -2 (x - 5/4)_2 + 49/8.$

[5] **Complete the square:**

$y = x_2 - 5x + 4$

$y = 1 (x - 5 +) + 4$

$y = 1 (x - 5 + 25/4) + 4 – 1(25/4)$

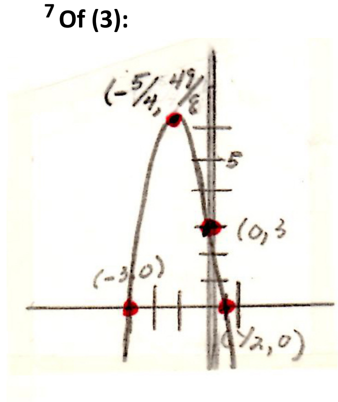
$y = (x - 5/2)_2 = 16/4 – 25/4$

$y = (x - 5/2) – 9/4$

[6] **For (4): Vertex (-5/4, 49/8)**

For (5): Vertex (5/2, -9/4)

[7] **Of (3):**



For the graph of the quadratic equality
$y = ax^2 + bx + c$**,**
the maximum or minimum points will be
by the factors in footnote eight, you see.[1]

The ***x*** **vertex coordinate comes into play**
by evaluating negative ***b*** **divided by 2*a*.**
The ***y*** **coordinate's likewise calculated**
when the second factor is evaluated.
Or, solve for ***y*** **this final way:**
replace ***x*** **in the formula with negative** ***b*** **over 2*a*.**

Finally: If you wind up with ***real x*** **intercepts,**
the graph (as indicated) is so sketched.
If imaginary, fix one or two points on the curve;
then, using symmetry, complete the swerve.

You may have noted on the page before this
that the position of the 'square' notation went amiss,
along with a few missing places in spacing
in the formulas shown in footnotes four though six.

Apologies there, for any misunderstanding
[It all has to do with that typing- and- hands thing!]
There are a few further notes that were made back then;
alas, at this date they are far from my ken.
But then maybe they are worthwhile to leave;
Perhaps another mind may further their weave….

A log is an exponent on a base of 10, which permits computations without end. Convert any number to its scientific label and find its mantissa on the table, to which you will add the correct integer that will reflect its appropriate character.

If the number represented has been decimated, a positive character then is created. Also curious, if the notation is appreciated, a negative character is indicated.

(Also something about: Not straightforwardly as you may apprehend, but as the difference of the total spaces and 10….)

[1] $\left(-\frac{b}{2a} \;,\; \frac{4ac - b^2}{4a} \right)$