PROGRAMMING
A STIMULUS FOR MATHEMATICAL DISCOVERY AND CREATIVITY

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While attempting to write a computer program that would provide practice for beginning algebra students learning to factor quadratic equations, I discovered the following theorem. A search of the literature at the time (November, 1988) indicated my discovery might be original. However, whether the theorem is original or not, it produces the algorithm which made it possible for me to write the program I needed. More importantly, it demonstrates how attempting to program a computer to perform a certain task, can be a stimulus for mathematical discovery and creativity.

Below, I have state the theorem, presented a proof, and given an example. Finally, I give some "RUNS" of the program to show what happens in different situations.

THEOREM

If d,e elements of R; d + e = b; de = ac, then, $ax^2 + bx + c = \frac{(ax+d)(ax+e)}{a}$.

PROOF

$$ax^2 + bx + c = \frac{a^2x^2 + abx + ac}{a}$$

$$= \frac{a^2x^2 + a(d+e)x + de}{a}$$

$$= \frac{a^2x^2 + adx + aex + de}{a}$$

$$= \frac{(ax+d)(ax+e)}{a}$$ **QED**

EXAMPLE

Factor: $5x^2 + 38x + 21$

$a \bullet c = 5(21) = 105$

$a \bullet c = 105 = d \bullet e$

Choose $d = 3$ and $e = 35$

Since, $d + e = b$, i.e., $3 + 35 = 38$

$$ax^2 + bx + c = \frac{(5x+3)(5x+35)}{5}$$

$$= \frac{(5x+3)(5)(x+7)}{5} = (5x + 3)(x + 7).$$

RUNS

THIS PROGRAM WILL FACTOR A QUADRATIC EQUATION IN THE FORM $AX^2 + BX + C$.

ENTER A

? 1

ENTER B

? 5

ENTER C

? 6

(X + 2)(X + 3)

WOULD YOU LIKE FOR ME TO FACTOR ANOTHER ONE?

? YES

THIS PROGRAM WILL FACTOR A QUADRATIC EQUATION IN THE FORM $AX^2 + BX + C$.

ENTER A

? 1

ENTER B

? 2

ENTER C

? 1

(5X + 1)(5X + 1)

WOULD YOU LIKE FOR ME TO FACTOR ANOTHER ONE?

? YES

THIS PROGRAM WILL FACTOR A QUADRATIC EQUATION IN THE FORM $AX^2 + BX + C$.

ENTER A

? 100

ENTER B

? 200

ENTER C

? 1000

(50x + 50)(2X + 2)