ALGORITHM 31
GAMMA FUNCTION

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**real procedure** Gamma (x); **real** x;

**comment** For \( x \) in the range \( 2 \leq x \leq 3 \) an approximating polynomial is used. In this range the maximum absolute error \( e(x) \) is \( |e(x)| < 0.25 \times 10^{-3} \). For \( x > 3 \) we write

\[
\Gamma(x) = (x-1)(x-2) \ldots (x-n)\Gamma(x-n)
\]

where \( 2 \leq (x-n) \leq 3 \), and for \( x < 2 \) we write

\[
\Gamma(x+n) = \frac{\Gamma(x+1) \ldots (x+n-1)}{x(x+1) \ldots (x+n-1)}
\]

or a negative integer \( \Gamma(x) \) is set equal to a large value \( 10^{40} \).

**begin**

**real** h, y;

h := 1.0; y := x;

A1: if \( y = 0 \) then h := \( 10^{40} \)

else if \( y = 2.0 \) then go to A2

else if \( y < 2.0 \) then begin

h := h/y; y := y + 1.0; go to A1 end

else if \( y \geq 3.0 \) then begin

y := y - 1.0; h := h \times y; go to A1 end

else begin

y := y - 2.0;

h := (((((.0016003118 \times y + .005188951) \times y

+ .044511400) \times y + .072110187) \times y

+ .082117494) \times y + .117741955) \times y

+ .227874605) \times y + .999999738) \times h end;

A2: Gamma := h end Gamma.

CERTIFICATION OF ALGORITHM 31
GAMMA FUNCTION [R. M. COLLINGE, *Comm. ACM*, Feb. 61]

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GAMMA was successfully run on FACIT EDB using Facit-Algol 1, which is a realization of Algol 60 for FACIT EDB. No changes in the program were necessary. The relative error was as stated in the comment of GAMMA about \( 10^{-4} \).

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