

- * Main problems are, when if() written in function, solve can't be used for that function.
 - * Recursive calls can't be used if line not used.
 - * If line is used (and with case), functions with recursive call can't solve.
- Function 1 can be called recursively, but can't solve.
 - Function 2 can't be called recursively, but can solve.
 - Function 3 can be called recursively, but can't solve.
 - Function 4 can't called recursively and can't solve.
 - Using line doesn't matter with if(), can't solve with them. Serious issue.
 - Sometimes I have to use line for functions. Because when I don't, there will be defined variables thrown outside of function. Using line automatically clears them.
 - Sometimes recursive calls can be avoided, but only sometimes...

Gamma Function_1 (cases, line)

```

Γ_1(a):= { (a-1)! if a=trunc(a)
           sin(π·a)·Γ_1(1-a) if a<0.5
           a_T:=a-1 otherwise
           x:=0.999999999999999709182
           g:=4.7421875
           for i∈ [1..length(#_p)]
             x:=x + (#_p i) / (a_T + i)
           t:=a_T + g + 0.5
           ( (a_T + 0.5) / t )^(1.25) · (e^(-t) · √(2·π) · x)^(1.25)

Clear(x ; i ; g ; t ; a_T)=1
Γ_1(0.2)=4.5908
Γ_1(5.46)=49.0839
solve(Γ_1(x)-120 ; x ; 1 ; 10)=
lastError="Cannot calculate."
IsDefined(t)=0
IsDefined(x)=0
IsDefined(i)=1
IsDefined(g)=0
IsDefined(a_T)=0
x:=1
IsDefined(a_T)=0
Clear(x ; i ; g ; t ; a_T)=1

```

Gamma Function_2 (cases, no line)

```

Γ_2(a):= { (a-1)! if a=trunc(a)
           sin(π·a)·Γ_2(1-a) if a<0.5
           a_T:=a-1 otherwise
           x:=0.999999999999999709182
           g:=4.7421875
           for i∈ [1..length(#_p)]
             x:=x + (#_p i) / (a_T + i)
           t:=a_T + g + 0.5
           ( (a_T + 0.5) / t )^(1.25) · (e^(-t) · √(2·π) · x)^(1.25)

Clear(x ; i ; g ; t ; a_T)=1
Γ_2(0.2)=
Γ_2(5.46)=49.0839
solve(Γ_2(x)-120 ; x ; 1 ; 10)=6
lastError="Γ_2(#) - function is not defined."
IsDefined(t)=1
IsDefined(x)=1
IsDefined(i)=1
IsDefined(g)=1
IsDefined(a_T)=1
x:=1
IsDefined(a_T)=1

```

 $a_T = 0$ $x = 1$ $g = 4.7422$ $t = 5.2422$ $i = 14$

Remnants of functions after solve when line not used.
 These could cause some troubles if not checked.
 They may havoc the functions after them that has same named variables.

Clear(x ; i ; g ; t ; a_T)=1

Gamma Function_3 (if, line)

```

 $\Gamma_3(a) :=$  if  $a = \text{trunc}(a)$ 
   $(a-1)!$ 
else
  if  $a < 0.5$ 
     $\frac{\pi}{\sin(\pi \cdot a) \cdot \Gamma_3(1-a)}$ 
  else
     $a_T := a - 1$ 
     $x := 0.999999999999999709182$ 
     $g := 4.7421875$ 
    for  $i \in [1..length(\#_p)]$ 
       $x := \text{eval}\left(x + \frac{\#_p i}{a_T + i}\right)$ 
     $t := \text{eval}(a_T + g + 0.5)$ 
     $\left(t^{\frac{a_T + 0.5}{1.25}} \cdot \left(e^{-t} \cdot \sqrt{2 \cdot \pi} \cdot x\right)^{\frac{1}{1.25}}\right)^{1.25}$ 

```

Clear($x ; i ; g ; t ; a_T$) = 1 $\Gamma_3(0.2) = 4.5908$ $\Gamma_3(5.46) = 49.0839$ solve($\Gamma_3(x) - 120 ; x ; 1 ; 10$) = ■

lastError = "x - not defined."

IsDefined(t) = 0IsDefined(x) = 0IsDefined(i) = 1IsDefined(g) = 0IsDefined(a_T) = 0 $x := 1$ IsDefined(a_T) = 0Clear($x ; i ; g ; t ; a_T$) = 1

Gamma Function_4 (if, no line)

```

 $\Gamma_4(a) :=$  if  $a = \text{trunc}(a)$ 
   $(a-1)!$ 
else
  if  $a < 0.5$ 
     $\frac{\pi}{\sin(\pi \cdot a) \cdot \Gamma_4(1-a)}$ 
  else
     $a_T := a - 1$ 
     $x := 0.999999999999999709182$ 
     $g := 4.7421875$ 
    for  $i \in [1..length(\#_p)]$ 
       $x := \text{eval}\left(x + \frac{\#_p i}{a_T + i}\right)$ 
     $t := \text{eval}(a_T + g + 0.5)$ 
     $\left(t^{\frac{a_T + 0.5}{1.25}} \cdot \left(e^{-t} \cdot \sqrt{2 \cdot \pi} \cdot x\right)^{\frac{1}{1.25}}\right)^{1.25}$ 

```

Clear($x ; i ; g ; t ; a_T$) = 1 $\Gamma_4(0.2) =$ ■ $\Gamma_4(5.46) = 49.0839$ lastError = " $\Gamma_4(\#)$ - function is not defined."solve($\Gamma_4(x) - 120 ; x ; 1 ; 10$) = ■

lastError = "x - not defined."

IsDefined(t) = 1IsDefined(x) = 1IsDefined(i) = 1IsDefined(g) = 1IsDefined(a_T) = 1 $x := 1$ IsDefined(a_T) = 1Clear($x ; i ; g ; t ; a_T$) = 1

When Function 4 could solve or calculate, there are remnants of it. Because of not using the line before algorithm, same as Function 2. It doesn't have to be a complicated function. Even a most simple one gives those errors.

```

 $f(x) :=$  if  $x < 5$ 
   $a := x^2$ 
   $a + x$ 
else
   $x^3$ 
 $g(y) :=$  if  $y < 5$ 
   $z := y^2$ 
   $z + y$ 
else
   $y^3$ 
 $r(t) :=$   $\begin{cases} s := t^2 & \text{if } t < 5 \\ s + t \\ t^3 & \text{otherwise} \end{cases}$ 
 $h(j) :=$   $\begin{cases} k := j^2 & \text{if } j < 5 \\ k + j \\ j^3 & \text{otherwise} \end{cases}$ 
 $f(4) = 20$   $g(4) = 20$   $\text{solve}(f(x) - 20 ; x ; 1 ; 10) =$  ■  $s = 16$   $j =$  ■  $\text{solve}(r(x) - 20 ; x ; 1 ; 10) = 4$ 
 $a = 16$   $z =$  ■  $\text{solve}(g(x) - 20 ; x ; 1 ; 10) =$  ■  $\text{solve}(h(x) - 20 ; x ; 1 ; 10) = 4$ 

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