Step-by-step integration

This is another nice example drawn from the Pythontex gallery, see https://github.com/gpoore/pythontex.

It shows the step-by-step computations of a simple triple integral.

```
1    xmax = 2;  ymax = 3;  zmax = 4;
2    xmin = 0;  ymin = 0;  zmin = 0;
3
4    fun = f[x,y,z];
5
6    mytmp = HoldForm[Integrate[#1, {z, #6, #7},
7                               {y, #4, #5},
8                               {x, #2, #3}]] & @@ {fun, xmin, xmax, ymin, ymax, zmin, zmax};   (* mma(lhs.01,mytmp) *)
9
10   fun = x y + y Sin[z] + Cos[x+y];
11
12   myint = HoldForm[Integrate[#1, {z, #6, #7},
13                               {y, #4, #5},
14                               {x, #2, #3}]] & @@ {fun, xmin, xmax, ymin, ymax, zmin, zmax};   (* mma(rhs.01,myint) *)
15
16   myansx =           Integrate[#1, {x, #2, #3}] & @@ {fun, xmin, xmax};
17   myintx = HoldForm[Integrate[#1, {z, #4, #5},
18                               {y, #2, #3}]] & @@ {myansx, ymin, ymax, zmin, zmax};            (* mma(rhs.02,myintx) *)
19
20   myansxy =         Integrate[#1, {y, #2, #3}]  & @@ {myansx, ymin, ymax};
21   myintxy = HoldForm[Integrate[#1, {z, #2, #3}]] & @@ {myansxy, zmin, zmax};                  (* mma(rhs.03,myintxy) *)
22
23   myansxyz = Integrate[#1, {z, #2, #3}] & @@ {myansxy, zmin, zmax};                           (* mma(rhs.04,myansxyz) *)
24
25   myapprox = N[myansxyz,15];                                                                  (* mma(rhs.05,myapprox) *)
```

$$\int_0^4 \int_0^3 \int_0^2 f(x,y,z)dxdydz = \int_0^4 \int_0^3 \int_0^2 (xy + \cos(x+y) + y\sin(z))dxdydz$$

$$= \int_0^4 \int_0^3 2(y + \cos(1+y)\sin(1) + y\sin(z))dydz$$

$$= \int_0^4 (8 + \cos(2) + \cos(3) - \cos(5) + 9\sin(z))\,dz$$

$$= 41 + 4\cos(2) + 4\cos(3) - 9\cos(4) - 4\cos(5)$$

$$\approx 40.1235865133293$$

```
\begin{align*}
   \mma{lhs.01} &= \mma{rhs.01}\\
                &= \mma{rhs.02}\\
                &= \mma{rhs.03}\\
                &= \mma{rhs.04}\\[8pt]
                &\approx \mma{rhs.05}
\end{align*}
```