cell array of integrals

```
[I Inew f fnew F Fanti] = deal(cell(4,1));
[U Iu Iunew fu funew Fu Funew] = deal(I);
[V Iv Ivnew fv fvnew Fv Fvnew] = deal(I);
[W Iw Iwnew fw fwnew Fw Fwnew] = deal(I);
[T It Itnew ft ftnew Ft Ftnew] = deal(I);
[Iunewsum Ivsumnew Iwsumnew] = deal(I);
[Iuv Fuv fuv] = deal(I);
[dV Ibp Ibpnew Iubp Ivbp Iubpsum Ivbpsum] = deal(I);
[dV2 Ibp2 Iubp2new Iubp2 Ivbp2] = deal(I);
[Isum Isumr Iusum Iusumr Ivsum Ivsumr] = deal(I);
[If Ifr dIf dIfr d2If d2Ifr] = deal(I);
[Ifu Ifur dIfu dIfur d2Ifu d2Ifur] = deal(I);
[Ifv Ifvr dIfv dIfvr d2Ifv d2Ifvr] = deal(I);
[Ifsum Ifsumr dIfsum dIfsumr d2Ifsum d2Ifsumr] = deal(I);
[Ifusum Ifusumr dIfusum dIfusumr] = deal(I);
[Ifvsum Ifvsumr dIfvsum dIfvsumr] = deal(I);
[Imaz Iumaz Ivmaz Iwmaz Itmaz] = deal(I);
[Fmaz Fumaz Fvmaz Fwmaz Ftmaz] = deal(I);
[fmaz fumaz fvmaz fwmaz ftmaz] = deal(I);
[even odd Amaz Bmaz] = deal(I);
[Ixyz Fxyz fxyz] = deal(I);
[Iyz Fyz fyz] = deal(I);
[Iy Fy fy] = deal(I);
[Ixy Fxy fxy] = deal(I);
[Ixysum Iysum] = deal(I);
syms x y z u v w t k;
syms N A B C D H phi;
```

integral 1

https://www.youtube.com/watch?v=8x5SHcHMmD4

```
% integral definition
f{1}(x) = 1/(exp(x)*sqrt(1-exp(-2*x)));
I{1} = int(formula(f{1}), Hold=true);
I{1}
```

ans =

$$\int \frac{e^{-x}}{\sqrt{1-e^{-2\,x}}}\,dx$$

```
% u-substitution
U{1} = exp(-x);
Iu{1} = changeIntegrationVariable(I{1}, U{1}, u);
Iu{1}
```

ans =

$$\int \left(-\frac{1}{\sqrt{1-u^2}}\right)du$$

```
% final answer in terms of u
fu{1}(u) = children(Iu{1}, 1);
Fu{1}(u) = quad1rat_int(-1/2, -1, 0, 1, 0, -1, u, Method='one');
Fu{1}
```

ans(u) = $-\mathrm{asin}(u)$

```
% final answer in terms of x
F{1}(x) = subs(Fu{1}, u, U{1});
F{1}
```

ans(x) = $-\mathrm{asin}(\mathrm{e}^{-x})$

integral 2

https://www.youtube.com/watch?v=CpwegX2VR40

```
% integral definition
[Fanti{2}(x) f{2}(x)] = quad1rat_int(1/2, -3, 0, 12, 0, 1, Method='one');
I{2} = int(f{2}, 0, 2, Hold=true);
I{2}
```

ans =

$$\int_0^2 \sqrt{12-3\,x^2}\,\mathrm{d}x$$

```
% antiderivative
Fanti{2}
```

ans(x) =

$$\frac{x\,\sqrt{12-3\,x^2}}{2}+2\,\sqrt{3}\,\mathrm{asin}\left(\frac{x}{2}\right)$$

```
% final answer
F{2} = Fanti{2}(2)-Fanti{2}(0);
F{2}
```

ans = $\pi\,\sqrt{3}$

integral 3

https://www.youtube.com/watch?v=4gFO4xs7cic

```
% integral definition
[F{3}(x) f{3}(x)] = tan_int(3, 1, 0);
I{3} = int(formula(f{3}), Hold=true);
I{3}
```

ans =

$$\int \tan(x)^3 \mathrm{d}x$$

```
% final answer
F{3}
```

ans(x) =

$$\frac{\tan(x)^2}{2} + \log(\cos(x))$$

integral 4

https://www.youtube.com/watch?v=fsI9IV-LcIA

```
% integral definition
f{4}(x) = exp(x/2)/(1+exp(x));
I{4} = int(formula(f{4}), Hold=true);
I{4}
```

ans =

$$\int \frac{e^{x/2}}{e^x + 1} \mathrm{d}x$$

```
% u-substitution
U{4} = exp(x/2);
Iu{4} = changeIntegrationVariable(I{4}, U{4}, u);
Iu{4}
```

ans =

$$\int \frac{2}{u^2 + 1} \mathrm{d}u$$

```
% final answer in terms of u
fu{4}(u) = children(Iu{4}, 1);
Fu{4} = int(fu{4});
Fu{4}
```

ans(u) = $2 \,\mathrm{atan}(u)$

```
% final answer in terms of x
F{4}(x) = subs(Fu{4}, u, U{4});
F{4}
```

ans(x) = $2 \,\mathrm{atan}(e^{x/2})$

integral 5

https://www.youtube.com/watch?v=rPu2AHQsT9o

```
% integral definition
f{5}(x) = sin(x)^x*(log(sin(x))+x*cot(x));
```

```
I{5} = int(formula(f{5}), Hold=true);
I{5}
```

ans =

$$\int \sin(x)^x\ (\log(\sin(x)) + x\cot(x))\mathrm{d}x$$

integral 6

https://www.youtube.com/watch?v=xMUfrW2sRqc

```
% integral definition
f{6}(x) = 1/(x*(x+1)^2);
I{6} = int(formula(f{6}), Hold=true);
I{6}
```

ans =

$$\int \frac{1}{x\ (x+1)^2}\mathrm{d}x$$

```
% integral manipulation
fnew{6} = partfrac(f{6});
Inew{6} = intsubs(I{6}, f{6}, fnew{6});
Inew{6}
```

ans =

$$\int \left(\frac{1}{x} - \frac{1}{(x+1)^2} - \frac{1}{x+1}\right)\mathrm{d}x$$

```
% final answer
Cell = cell(3,1);
Cell{1} = sym([-1 0 1 0 0 1]);
Cell{2} = sym([-2 0 1 1 0 -1]);
Cell{3} = sym([-1 0 1 1 0 -1]);
[n a b c alpha beta] = components2vector(Cell{:});
F{6}(x) = sum(quad1rat_int(n, a, b, c, alpha, beta, Method='one'));
F{6}
```

ans(x) =

$$\log(x) - \log(x+1) + \frac{1}{x+1}$$

integral 7

```
% integral definition
f{7}(x) = sin(x+A)/sin(x-A);
I{7} = int(formula(f{7}), Hold=true);
I{7}
```

ans =

$$\int \left(-\frac{\sin(A+x)}{\sin(A-x)}\right) \mathrm{d}x$$

```
% integral manipulation
fnew{7} = expand(f{7});
Inew{7} = simplifyFraction(intsubs(I{7}, f{7}, fnew{7}));
Inew{7}
```

ans =

$$\int \frac{\cos(A)\sin(x)+\sin(A)\cos(x)}{\cos(A)\sin(x)-\sin(A)\cos(x)} \mathrm{d}x$$

```
% final answer
F{7}(x) = sincosf_int(1, 0, cos(A), sin(A), cos(A), -sin(A));
F{7}
```

ans(x) =

$$\frac{x\,(\cos(A)^2-\sin(A)^2)}{\cos(A)^2+\sin(A)^2}+\frac{2\cos(A)\log(\cos(A)\sin(x)-\sin(A)\cos(x))\sin(A)}{\cos(A)^2+\sin(A)^2}$$

integral 8

https://www.youtube.com/watch?v=VRc0NnVJQxU

```
% integral definition
f{8}(x) = sin(x)^2/(sin(x)^2+1);
I{8} = int(formula(f{8}), Hold=true);
I{8}
```

ans =

$$\int \frac{\sin(x)^2}{\sin(x)^2+1} \mathrm{d}x$$

```
% integral manipulation
fnew{8}(x) = 1-sec(x)^2/(2*tan(x)^2+1);
Inew{8} = intsubs(I{8}, f{8}, fnew{8});
Inew{8}
```

ans =

$$\int \left(1-\frac{1}{\cos(x)^2\,(2\tan(x)^2+1)}\right) \mathrm{d}x$$

```
% u-substitution
U{8} = tan(x);
fu{8}(u) = x-1/(2*u^2+1);
Iu{8} = x-int(x-formula(fu{8}), Hold=true);
Iu{8}
```

ans =

$$x - \int \frac{1}{2\,u^2+1}\,\mathrm{d}u$$

```
% final answer in terms of u
Fu{8}(u) = x-quad1rat_int(-1, 2, 0, 1, 0, 1, u, Method='one');
Fu{8} = Simplify(Fu{8});
Fu{8}
```

```
ans(u) =
```

$$x - \frac{\sqrt{2}\,\mathrm{atan}(\sqrt{2}\,u)}{2}$$

```
% final answer in terms of x
F{8}(x) = subs(Fu{8}, u, U{8});
F{8}
```

```
ans(x) =
```

$$x - \frac{\sqrt{2}\,\mathrm{atan}(\sqrt{2}\,\tan(x))}{2}$$

integral 9

https://www.youtube.com/watch?v=zo3JSIzZgw8

```
% integral definition
[F{9}(x) f{9}(x)] = sincos_int(2, -4, 1, 0);
I{9} = int(formula(f{9}), Hold=true);
I{9}
```

```
ans =
```

$$\int \frac{\sin(x)^2}{\cos(x)^4}\,\mathrm{d}x$$

```
% final answer
F{9}
```

```
ans(x) =
```

$$\frac{\tan(x)^3}{3}$$

integral 10

https://www.youtube.com/watch?v=Lvy_TQ5OR0M

```
% integral definition
f{10}(x) = 1/(1+sin(2*x));
I{10} = int(formula(f{10}), Hold=true);
I{10}
```

```
ans =
```

$$\int \frac{1}{\sin(2\,x)+1}\,\mathrm{d}x$$

```
% integral manipulation
fnew{10}(x) = sec(x)^2/(tan(x)+1)^2;
Inew{10} = intsubs(I{10}, f{10}, fnew{10});
Inew{10}
```

ans =

$$\int \frac{1}{\cos(x)^2\,(\tan(x)+1)^2}\,\mathrm{d}x$$

```
% u-substitution
U{10} = tan(x)+1;
Iu{10} = changeIntegrationVariable(Inew{10}, U{10}, u);
Iu{10}
```

ans =

$$\int \frac{1}{u^2}\,\mathrm{d}u$$

```
% final answer in terms of u
fu{10}(u) = children(Iu{10}, 1);
Fu{10}(u) = int(fu{10});
Fu{10}
```

ans(u) =

$$-\frac{1}{u}$$

```
% final answer in terms of x
F{10}(x) = subs(Fu{10}, u, U{10});
F{10}
```

ans(x) =

$$-\frac{1}{\tan(x)+1}$$

integral 11

https://www.youtube.com/watch?v=Bx_HwwlW-G8&list=WL&index=69&t=10s

```
% integral definition
f{11}(x) = (1+cos(4*x))/(cot(x)-tan(x));
I{11} = int(formula(f{11}), Hold=true);
I{11}
```

ans =

$$\int \frac{\cos(4\,x)+1}{\cot(x)-\tan(x)}\,\mathrm{d}x$$

```
% integral manipulation
fnew{11}(x) = 2*cos(x)^3*sin(x)-2*sin(x)^3*cos(x);
Inew{11} = intsubs(I{11}, f{11}, fnew{11});
Inew{11}
```

```
ans =
```

$$\int (2\cos(x)^3\sin(x) - 2\cos(x)\sin(x)^3)\mathrm{d}x$$

```
% final answer
K = sym([2 -2]);
Cell = cell(2,1);
Cell{1} = sym([1 3 1 0]);
Cell{2} = sym([3 1 1 0]);
[n p a b] = components2vector(Cell{:});
F{11}(x) = sum(K.*sincos_int(n, p, a, b));
F{11}
```

`ans(x) =` $\cos(x)^2 - \cos(x)^4$