Costruzione incrementale differenze divise

```
> PSOL := x -> x^3/7-4*x+1;
```

$$PSOL := x \rightarrow \frac{1}{7} x^3 - 4x + 1 \tag{1}$$

```
> X := [0, 1, -3, 4, -2, -4] ;
```

$$X := [0, 1, -3, 4, -2, -4] \tag{2}$$

```
> Y := [seq(PSOL(X[i]),i=1..6)] ;
```

$$Y := \left[1, -\frac{20}{7}, \frac{64}{7}, -\frac{41}{7}, \frac{55}{7}, \frac{55}{7} \right] \tag{3}$$

Procedura che dato in ingresso due liste [x0,x1,...,x[k]] ed [f[x0],f[x0,x1],...,f[x0,x1,...,xk]]
e i valori x[k+1] e f(x[k+1]) restituisce la differenza divisa f[x0,x1,...,xn,x[k+1]]

```
> dd_update := proc( x, dd, xnew, fnew, n )
    local t, k ;
    t := fnew ;
    for k from 0 to n do
      t := (t-dd[k+1])/(xnew-x[k+1]) ;
    end:
    return t ;
  end ;
```

$$dd\_update := \mathbf{proc}(x, dd, xnew, fnew, n) \tag{4}$$

$\quad \mathbf{local}\ t, k;$

$\quad t := fnew;\ \mathbf{for}\ k\ \mathbf{from}\ 0\ \mathbf{to}\ n\ \mathbf{do}\ t := (t - dd[k+1])/(xnew - x[k+1])\ \mathbf{end\ do};$

$\quad \mathbf{return}\ t$

$\mathbf{end\ proc}$

```
> dd := [Y[1]] ;
```

$$dd := [1] \tag{5}$$

```
> dd_new := dd_update( X,dd, X[2], Y[2], 0 ) ;
  dd := [op(dd), dd_new] ;
```

$$dd\_new := -\frac{27}{7}$$

$$dd := \left[1, -\frac{27}{7} \right] \tag{6}$$

```
> dd_new := dd_update( X, dd, X[3], Y[3], 1 ) ;
  dd := [op(dd), dd_new] ;
```

$$dd\_new := -\frac{2}{7}$$

$$dd := \left[1, -\frac{27}{7}, -\frac{2}{7} \right] \tag{7}$$

```
> dd_new := dd_update( X, dd, X[4], Y[4], 2 ) ;
  dd := [op(dd), dd_new] ;
```

$$dd\_new := \frac{1}{7}$$

$$\tag{8}$$

$$dd := \left[1, -\frac{27}{7}, -\frac{2}{7}, \frac{1}{7} \right]$$ (8)

```
> dd_new := dd_update( X, dd, X[5], Y[5], 3 ) ;
  dd := [op(dd), dd_new] ;
```

$$dd\_new := 0$$

$$dd := \left[1, -\frac{27}{7}, -\frac{2}{7}, \frac{1}{7}, 0 \right]$$ (9)

```
> dd_new := dd_update( X, dd, X[6], Y[6], 4 ) ;
  dd := [op(dd), dd_new] ;
```

$$dd\_new := 0$$

$$dd := \left[1, -\frac{27}{7}, -\frac{2}{7}, \frac{1}{7}, 0, 0 \right]$$ (10)