Maple index for Scrambler doc PhL 8.31.13

I will scan through scrambler looking for Maple stuff

Above 1.2.8: Don't have these 3 lines anywhere:

```
f := (z^2+1)/(z+1) - (z-1)-2/(z+1): simplify(%);
```

$$0$$

```
f := (z^2+1)/(z+1) - (z-1+2/z)+(2/z)/(z+1): simplify(%);
```

$$0$$

```
f := (z^2+1)/(z+1) - (z-1+2/z-2/z^2)-(2/z^2)/(z+1): simplify(%);
```

$$0$$

Below 1.2.9: in scram support 4.mws

```
f := (1+1/z)/(z^2 + z + 1);
```

$$f := \frac{1+\frac{1}{z}}{z^2+z+1}$$

```
sum( z^(-3*n+1) - z^(-3*n-1),  n= 1..5);
```

$$\frac{1}{z^2}-\frac{1}{z^4}+\frac{1}{z^5}-\frac{1}{z^7}+\frac{1}{z^8}-\frac{1}{z^{10}}+\frac{1}{z^{11}}-\frac{1}{z^{13}}+\frac{1}{z^{14}}-\frac{1}{z^{16}}$$

```
g := sum( z^(-3*n+1) - z^(-3*n-1),  n= 1..infinity);
```

$$g := \frac{\left(\frac{1}{z^2}-\frac{1}{z^4}\right)z^3}{z^3-1}$$

```
f-g:  simplify(%);
```

$$0$$

Below 2.3.11: Probably from some GA mws file

```
p = 2, m = 4, q-1 = 15
Number of Primitive Polynomials is 2
Number of Minimum Polynomials is 4
```

$$[7, 11, 13, 14, Prim], (x-a^7)(x-a^{11})(x-a^{13})(x-a^{14}), 15$$

$$[5, 10], (x-a^5)(x-a^{10}), 3$$

$$[1, 2, 4, 8, Prim], (x-a)(x-a^2)(x-a^4)(x-a^8), 15$$

$$[3, 6, 9, 12], (x-a^3)(x-a^6)(x-a^9)(x-a^{12}), 5$$

in GF512charseq.mws

```
h := 1 + x + x^2 + x^3 + x^4;
```

$$h := 1 + x + x^2 + x^3 + x^4$$

```
g := Quo(x^5-1,h,x) mod 2;
```

$$g := x + 1$$

```
Rem(x^5-1,h,x) mod 2;
```

$$0$$

```
h := 1 + x + x^4:
g := Quo(x^15-1,h,x) mod 2;
```

$$g := x^{11} + x^8 + x^7 + x^5 + x^3 + x^2 + x + 1$$

```
Rem(x^15-1,h,x) mod 2;
```

$$0$$

```
c := coeff(g,x,0):
for n from 1 to 14 do
   c := c,coeff(g,x,n);
od:
c;
```

$$1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0$$

in GF512charseq.mws

```
for n from 16 to 2 by -1 do
    d := seq(c[i],i=n..15),seq(c[i],i=1..n-1):
    num := convert(sum((d[16-j])*2^(j-1),j=1..15),octal);
    print(d,"              ",num);
od:
```

$$1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, "\quad ", 75310$$
$$0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, "\quad ", 36544$$
$$0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, "\quad ", 17262$$
$$0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, "\quad ", 7531$$
$$1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 0, "\quad ", 43654$$
$$0, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, "\quad ", 21726$$
$$0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 1, "\quad ", 10753$$
$$1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, "\quad ", 44365$$
$$1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, 0, "\quad ", 62172$$
$$0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 0, 1, "\quad ", 31075$$
$$1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, 0, "\quad ", 54436$$
$$0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 1, "\quad ", 26217$$
$$1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, "\quad ", 53107$$
$$1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, "\quad ", 65443$$
$$1, 1, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, "\quad ", 72621$$

Below 2.3.17: in GF512charseq.mws

```
> h := 1 + x^4 + x^9:
> Rem(x^511-1,h,x) mod 2;
                                    0
> g1 := Quo(x^511-1,h,x) mod 2:
> g := sort(g1,x);
```

$$g := x^{502} + x^{497} + x^{493} + x^{492} + x^{487} + x^{484} + x^{483} + x^{482} + x^{479} + x^{477} + x^{475} + x^{473} + x^{472} + x^{467} + x^{466} + x^{464} + x^{463} + x^{462} + x^{461} + x^{459} + x^{456} + x^{455} + x^{453} + x^{452} + x^{451} + x^{448}$$

```
> c := coeff(g,x,0):
> for n from 1 to 510 do
     c := c,coeff(g,x,n);
  od:
> c;
```

1, 0, 0, 0, 1, 0, 0, 0, 1, 1, 0, 0, 1, 0, 0, 0, 1, 1, 1, 0, 1, 0, 1, 0, 1, 1, 0, 1, 1, 0, 0, 0, 1, 1, 1, 0, 0, 0, 1, 0, 0, 1,
0, 1, 0, 1, 0, 0, 0, 1, 1, 0, 1, 1, 0, 0, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 1, 1, 0, 0, 0, 1, 0, 1, 1, 0, 1, 1, 1, 0, 0, 1, 0, 1, 0,
0, 1, 0, 0, 0, 0, 0, 1, 0, 0, 1, 1, 0, 0, 1, 1, 1, 0, 1, 0, 0, 0, 1, 1, 1, 1, 1, 0, 1, 1, 1, 1, 0, 0, 0, 0, 0, 1, 1, 1, 1, 1,
1, 1, 1, 1, 0, 0, 0, 0, 1, 1, 1, 1, 0, 1, 1, 1, 0, 0, 0, 0, 1, 0, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 1, 1, 1, 0, 1, 0, 0, 0, 0,
1, 1, 1, 0, 0, 1, 1, 0, 0, 0, 0, 1, 0, 0, 1, 0, 0, 0, 1, 0, 1, 0, 1, 1, 1, 0, 1, 0, 1, 1, 1, 1, 0, 0, 1, 0, 0, 1, 0, 1, 1, 1,
0, 0, 1, 1, 1, 0, 0, 0, 0, 0, 0, 1, 1, 1, 0, 1, 1, 1, 0, 1, 0, 0, 1, 1, 1, 1, 0, 1, 0, 1, 0, 0, 1, 0, 1, 0, 0, 0, 0, 0, 0, 1,
0, 1, 0, 1, 0, 1, 0, 1, 1, 1, 1, 1, 0, 1, 0, 1, 1, 0, 1, 0, 0, 0, 0, 0, 1, 1, 0, 1, 1, 1, 0, 1, 1, 0, 1, 1, 0, 1, 0, 1, 1, 0,
0, 0, 0, 0, 1, 0, 1, 1, 1, 0, 1, 1, 1, 1, 1, 1, 0, 0, 0, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 0, 0, 1, 1, 0, 1, 0, 1, 1, 1, 0, 0, 0, 1,
1, 0, 1, 0, 0, 0, 1, 0, 1, 1, 1, 1, 1, 1, 1, 1, 0, 1, 0, 0, 1, 0, 1, 1, 0, 0, 0, 1, 0, 1, 0, 0, 1, 1, 0, 0, 0, 1, 1, 0, 0, 0, 0,
0, 0, 0, 1, 1, 0, 0, 1, 1, 0, 0, 1, 0, 1, 0, 1, 1, 0, 0, 1, 0, 0, 1, 1, 1, 1, 1, 1, 0, 1, 1, 0, 1, 0, 0, 1, 0, 0, 1, 0, 0, 1,
1, 0, 1, 1, 1, 1, 1, 1, 0, 0, 1, 0, 1, 1, 0, 1, 0, 1, 0, 0, 0, 0, 1, 0, 1, 0, 0, 0, 1, 0, 0, 1, 1, 1, 0, 1, 1, 0, 0, 1, 0, 1,
1, 1, 1, 0, 1, 1, 0, 0, 0, 0, 1, 1, 0, 1, 0, 1, 0, 1, 0, 0, 1, 1, 1, 0, 0, 1, 0, 0, 0, 0, 1, 1, 0, 0, 0, 1, 0, 0, 0, 0, 1, 0,
0, 0, 0, 0, 0, 0, 0

Below Fig 3.1: in scrambler 3_6.mws

```
tot :=  int(sinc(Pi*x)^2,x = 0..infinity);
```

$$tot := \frac{1}{2}$$

```
for h from 0 to 4 do
  hump := int(sinc(Pi*x)^2,x = h..h+1)/tot:
  print(h,evalf(hump));
od:
```

0, .9028233334
1, .04711600652
2, .01647109466
3, .008338015422
4, .005027892454

```
int(sinc(Pi*x)^2,x = 0..1/2)/tot: evalf(%);
```

.7736950098

In Appendix A:

The following is in temp1.mws:

```
f1 := 2*z + 2 + 1/z + 6/z^2:
f2 := 3 + 4/z + 2/z^2:
f := expand(f1*f2) mod 10;
```

$$f := 6z + 4 + 5\frac{1}{z} + 6\frac{1}{z^2} + 6\frac{1}{z^3} + 2\frac{1}{z^4}$$

The following is in recur1.mws:

```
Digits := 70:
22.16/3.42;
```

$$6.47953216374269005847953216374269005847953216374269005847953216374269$$

The following is in recursion.mws:

```
for j from -10 to 100 do i[j] := 0 od:          # clear out all i values
i[-3] := 2: i[-2] := 2: i[-1] := 1: i[0] := 6:  # set non-zero i values
a := 7: b := 4: c := 8:                         # set parameters
o(-3) := 0: o(-2) := 0:                         # initial values
for n from -3 to 40 do    # use recursion relation to compute the o values
     o(n+2) := a*i[n] - b*o(n) - c*o(n+1) mod 10;
od:
x := seq(o(n),n=-1..40);  # display these values
```

$$x := 4, 2, 5, 4, 8, 0, 8, 6, 0, 6, 2, 0, 2, 4, 0, 4, 8, 0, 8, 6, 0, 6, 2, 0, 2, 4, 0, 4, 8, 0, 8, 6, 0, 6, 2, 0, 2, 4, 0, 4, 8, 0$$

```
unprotect(O): O := 0:   # it happens that O is the Order-Of function in Maple
for n from -1 to 20 do  # construct the polynomial O(z) from the o(n)
  O := O + o(n)*z^(-n);
  od:
O;
```

$$4z + 2 + 5\frac{1}{z} + 4\frac{1}{z^2} + 8\frac{1}{z^3} + 8\frac{1}{z^5} + 6\frac{1}{z^6} + 6\frac{1}{z^8} + 2\frac{1}{z^9} + 2\frac{1}{z^{11}} + 4\frac{1}{z^{12}} + 4\frac{1}{z^{14}} + 8\frac{1}{z^{15}} + 8\frac{1}{z^{17}} + 6\frac{1}{z^{18}} + 6\frac{1}{z^{20}}$$

```
H := 3*z^2+4*z+2:
I_ := 2*z^3+2*z^2+1*z+6:
expand(O*H - I_) mod 10: sort(%);
```

$$4\frac{1}{z^{19}} + 2\frac{1}{z^{20}}$$

The following is in recur1.mws:

```
for j from -10 to 100 do i[j] := 0 od:          # clear out all i values
i[-3] := 2: i[-2] := 2: i[-1] := 1: i[0] := 6:  # set non-zero i values
a := (1/4): b := (2/4): c := (3/4):             # set parameters
o(-3) := 0: o(-2) := 0:                         # initial values
for n from -3 to 40 do    #use recursion relation to compute the o values
     o(n+2) := a*i[n] - b*o(n) - c*o(n+1);
od:
x := seq(o(n),n=-1..8);  # display these values
```

$$x := \frac{1}{2}, \frac{1}{8}, \frac{-3}{32}, \frac{193}{128}, \frac{-555}{512}, \frac{121}{2048}, \frac{4077}{8192}, \frac{-13199}{32768}, \frac{6981}{131072}, \frac{84649}{524288}$$

```
unprotect(O): O := 0:    # it happens that O is the Order-Of function in Maple
for n from -1 to 8 do  # compute the polynomial O(z) = I(z)/H(z)
  O := O + o(n)*z^(-n);
  od:
O;
```

$$\frac{1}{2}z + \frac{1}{8} - \frac{3}{32}\frac{1}{z} + \frac{193}{128}\frac{1}{z^2} - \frac{555}{512}\frac{1}{z^3} + \frac{121}{2048}\frac{1}{z^4} + \frac{4077}{8192}\frac{1}{z^5} - \frac{13199}{32768}\frac{1}{z^6} + \frac{6981}{131072}\frac{1}{z^7} + \frac{84649}{524288}\frac{1}{z^8}$$

```
H := 4*z^2+3*z+2:
I_ := 2*z^3+2*z^2+1*z+6:
expand(O*H - I_): sort(%);
```

$$\frac{309795}{524288}\frac{1}{z^7} + \frac{84649}{262144}\frac{1}{z^8}$$