

Assignment 1 Question 5d

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```
> LagrangeInterp := proc(x::list,y::list,z::name)
  local n,M,i,L,a,beta,f;
  n := nops(x);
  if nops(y)<>n then error "x and y should be the same size" fi;

  M := 1;
  for i to n do M := expand(M*(z-x[i])); od;
  L := Array(1..n);
  for i to n do L[i] := quo(M,z-x[i],z) od;
  a := Array(1..n);
  for i to n do
    beta := eval(L[i],z=x[i]);
    if beta=0 then error "x points must be distinct" fi;
    a[i] := y[i]/beta;
  od;
  f := 0;
  for i to n do f := f+a[i]*L[i] od;
  f;
end:
```

```
> x := [0,1,2];
  y := [1,3,4];
```

```
      x := [0, 1, 2]
      y := [1, 3, 4]
```

(1)

```
> f := LagrangeInterp(x,y,z);
```

$$f := -\frac{1}{2}z^2 + \frac{5}{2}z + 1$$

(2)

```
> seq( eval(f,z=x[i]), i=1..3 ); # check
      1, 3, 4
```

(3)

```
> x := [1,2,3,4];
  y := [-1,2,7,14];
  f := LagrangeInterp(x,y,z);
```

```
      x := [1, 2, 3, 4]
      y := [-1, 2, 7, 14]
      f := z^2 - 2
```

(4)

```
> seq( eval(f,z=x[i]), i=1..4 );
```

```
      -1, 2, 7, 14
```

(5)