In[10]:=
```
(**1**)

h0 = 1;
h1 = 1;

a0 = 0;
a1 = 1;
a2 = 2;

fp = 2;

A = {{2 h0, h0, 0}, {h0, 2 (h0 + h1), h1}, {0, h0, 2 h0}};

B = {{3/h0 (a1 - a0) - 3 fp}, {3/h1 (a2 - a1) - 3/h0 (a1 - a0)}, {3 fp - 3/h1 (a2 - a1)}};

sols = Solve[A.{c0, c1, c2} == B, {c0, c1, c2}]
```

Out[18]=
$$\left\{\left\{c0 \to -\frac{3}{2},\ c1 \to 0,\ c2 \to \frac{3}{2}\right\}\right\}$$

In[97]:=
```
a[0] = 0;
a[1] = 1;
a[2] = 2;

c[0] = -3/2;
c[1] = 0;
c[2] = 3/2;

h[0] = 1;
h[1] = 1;

b[j_] := 1/h[j] (a[j + 1] - a[j]) - h[j]/3 (2 c[j] + c[j + 1])

b0 = b[0];
b1 = b[1];

Print["b0=", b0]
Print["b1=", b1]

d[j_] := 1/(3 h[j]) (c[j + 1] - c[j])

d0 = d[0];
d1 = d[1];

Print["d0=", d0]
Print["d1=", d1]
```

b0=2

b1=$\frac{1}{2}$

d0=$\frac{1}{2}$

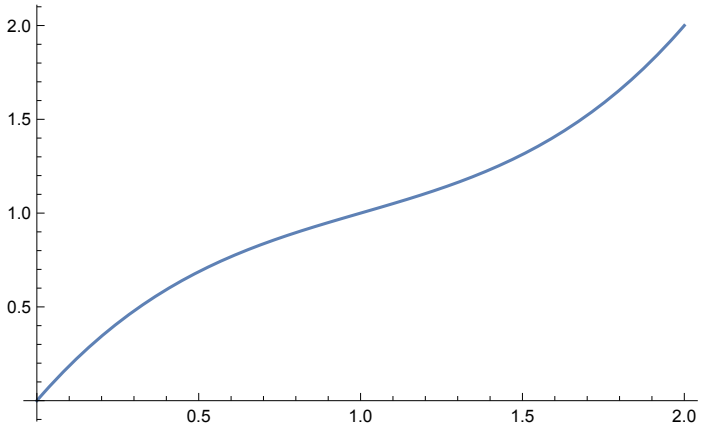
d1=$\frac{1}{2}$

In[174]:=
```
S0[x_] := a[0] + b[0] x + c[0] x^2 + d[0] x^3
S1[x_] := a[1] + b[1] (x - 1) + c[1] (x - 1)^2 + d[1] ( x - 1)^3

plots = Piecewise[{{S0[x], 0 ≤ x ≤ 1}, {S1[x], 1 ≤ x ≤ 2}}];

Plot[plots, {x, 0, 2}]
```

Out[177]=



In[28]:=
```
(**5**)

f[x_] := E^x

FD[h_] := (f[h] - f[0])/h // N

For[k = 2, k ≤ 12, k = k + 2,

 h = 10^-k;

 y = FD[h];
 Print["k=", k];
 Print["f'(0)≃", y];
 Print["Absolute Error =", Abs[y - f[0]]];]
```

```
k=2
f'(0)≃1.00502
Absolute Error =0.00501671
k=4
f'(0)≃1.00005
Absolute Error =0.0000500017
k=6
f'(0)≃1.
Absolute Error =4.99962×10^-7
k=8
f'(0)≃1.
Absolute Error =6.07747×10^-9
k=10
f'(0)≃1.
Absolute Error =8.27404×10^-8
k=12
f'(0)≃1.00009
Absolute Error =0.0000889006
```

In[137]:=
```
Plot[f[x], {x, 0, .000000000001}]
```

Out[137]=