Then the command

$h5 := PolynomialInterpolation(xy, method = hermite, independentvar = 'x')$

produces an array whose nonzero entries correspond to the values in Table 3.17. The Hermite interpolating polynomial is created with the command

$Interpolant(h5))$

This gives the polynomial in (almost) Newton forward-difference form

$$1.29871616 - 0.5220232x - 0.08974266667(x - 1.3)^2 + 0.06636555557(x - 1.3)^2(x - 1.6) + 0.002666666633(x - 1.3)^2(x - 1.6)^2 - 0.002774691277(x - 1.3)^2(x - 1.6)^2(x - 1.9)$$

If a standard representation of the polynomial is needed, it is found with

$expand(Interpolant(h5))$

giving the Maple response

$$1.001944063 - 0.0082292208x - 0.2352161732x^2 - 0.01455607812x^3 + 0.02403178946x^4 - 0.002774691277x^5$$

EXERCISE SET 3.4

1. Use Theorem 3.9 or Algorithm 3.3 to construct an approximating polynomial for the following data.

a.

x	$f(x)$	$f'(x)$
8.3	17.56492	3.116256
8.6	18.50515	3.151762

b.

x	$f(x)$	$f'(x)$
0.8	0.22363362	2.1691753
1.0	0.65809197	2.0466965

c.

x	$f(x)$	$f'(x)$
−0.5	−0.0247500	0.7510000
−0.25	0.3349375	2.1890000
0	1.1010000	4.0020000

d.

x	$f(x)$	$f'(x)$
0.1	−0.62049958	3.58502082
0.2	−0.28398668	3.14033271
0.3	0.00660095	2.66668043
0.4	0.24842440	2.16529366

2. Use Theorem 3.9 or Algorithm 3.3 to construct an approximating polynomial for the following data.

a.

x	$f(x)$	$f'(x)$
0	1.00000	2.00000
0.5	2.71828	5.43656

b.

x	$f(x)$	$f'(x)$
−0.25	1.33203	0.437500
0.25	0.800781	−0.625000

c.

x	$f(x)$	$f'(x)$
0.1	−0.29004996	−2.8019975
0.2	−0.56079734	−2.6159201
0.3	−0.81401972	−2.9734038

d.

x	$f(x)$	$f'(x)$
−1	0.86199480	0.15536240
−0.5	0.95802009	0.23269654
0	1.0986123	0.33333333
0.5	1.2943767	0.45186776

3. The data in Exercise 1 were generated using the following functions. Use the polynomials constructed in Exercise 1 for the given value of x to approximate $f(x)$, and calculate the absolute error.

a. $f(x) = x \ln x$; approximate $f(8.4)$.

b. $f(x) = \sin(e^x - 2)$; approximate $f(0.9)$.

c. $f(x) = x^3 + 4.001x^2 + 4.002x + 1.101$; approximate $f(-1/3)$.

d. $f(x) = x \cos x - 2x^2 + 3x - 1$; approximate $f(0.25)$.