

Sect 3.1

5d $f(0.9) = ?$

$f(0.6) = -0.17694460$
$f(0.7) = 0.01375227$
$f(0.8) = 0.22363362$
$f(1.0) = 0.65809197$

$$P_1(x) = \frac{(x-1)}{(0.8-1)} f(0.8) + \frac{(x-0.8)}{(1-0.8)} f(1.0) \quad P_2(0.9) = 0.5f(0.8) + 0.5f(1.0) = \boxed{0.44086280}$$

$$P_2(x) = \frac{(x-0.8)(x-1.0)}{(0.7-0.8)(0.7-1.0)} f(0.7) + \frac{(x-0.7)(x-1.0)}{(0.8-0.7)(0.8-1.0)} f(0.8) + \frac{(x-0.7)(x-0.8)}{(1-0.7)(1-0.8)} f(1.0)$$

$$P_2(0.9) = \left(-\frac{1}{3}\right) f(0.7) + (1) f(0.8) + \left(\frac{1}{3}\right) f(1.0) = \boxed{0.43841352}$$

$$P_3(x) = \frac{(x-0.7)(x-0.8)(x-1)}{(0.6-0.7)(0.6-0.8)(0.6-1)} f(0.6) + \dots + \frac{(x-0.6)(x-0.7)(x-0.8)}{(1-0.6)(1-0.7)(1-0.8)} f(1.0)$$

$$P_3(0.9) = (0.25) f(0.6) + (-1) f(0.7) + (1.5) f(0.8) + (0.25) f(1.0) = \boxed{0.44198500}$$

7d

x

$x_0 = 0.6$	$Q_{0,0} = -0.17694460$	$Q_{1,1} = 0.39514601$	$Q_{2,2} = 0.45269945$	$Q_{3,3} = 0.44198500$
$x_1 = 0.7$	$Q_{1,0} = 0.01375227$	$Q_{2,1} = 0.43351497$	$Q_{3,2} = 0.43841352$	
$x_2 = 0.8$	$Q_{2,0} = 0.22363362$	$Q_{3,1} = 0.44086280$		
$x_3 = 1.0$	$Q_{3,0} = 0.65809197$			

Actual value $\sin(e^{0.9} - 2) = 0.44359244$

9d $f(x) = \sin(e^x - 2)$
 $f'(x) = \cos(e^x - 2) \cdot e^x$
 $f''(x) = -\sin(e^x - 2) e^{2x} + \cos(e^x - 2) e^x$
 $f'''(x) = e^x \cos(e^x - 2) - e^x \sin(e^x - 2) e^x - 2e^{2x} \sin(e^x - 2) - e^{2x} \cos(e^x - 2) e^x$
 $= (e^x - e^{3x}) \cos(e^x - 2) - 3e^{2x} \sin(e^x - 2)$

on $[0.6, 1.0]$ max of $|f''(x)|$ and $|f'''(x)|$ are both at $x = 1.0$ (a)

use $f''(1) = 2.816$ $f'''(1) = 27.6625$

$n=1 \quad E \leq \frac{2.816}{2!} (0.9-0.8)(0.9-1) = 0.01408$ <p style="text-align: center; margin-left: 100px;">actual <u>0.00273</u></p>	$n=2 \quad E = \frac{27.665}{3!} (0.002) = 0.00922$ <p style="text-align: center; margin-left: 100px;">actual error <u>0.00518</u></p>
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Sect 3.2

MTH/csc 450 (2)
 Prof. R. B. Goldstein
 Chap 3 HW
 B + F - 8th

#1b	x	f(x)	1 st DD	2 nd DD	3 rd DD
	0.6	-0.1769 4460	1.9069 687	0.959224	-1.7857408
	0.7	0.0137 5227	2.0988135	0.244927	
	0.8	0.2236 3362	2.1722918		
	1.0	0.6580 9197			

$$P_3(x) = -0.17694460 + 1.9069687(x-0.6) + 0.959224(x-0.6)(x-0.7) - 1.7857408(x-0.6)(x-0.7)(x-0.8)$$

$$P_3(0.9) = -0.17694460 + 0.57209061 + 0.05755394 - 0.01071444 = \boxed{0.44198500}$$

#3b	x	f(x)	Δf	$\Delta^2 f$	$\Delta^3 f$
	0.1	-0.6204 9958			
	0.2	-0.2839 8668	> 0.3365 1290	> -0.0459 2527	> -0.00283871
	0.3	+0.0066 0095	> 0.2905 8763	> -0.0487 6418	
	0.4	+0.2484 2440	> 0.2418 2345		

$$s = \frac{0.25 - 0.1}{0.1} = 1.5$$

$$f(0.25) = -0.62049958 + 1.5(0.33651290) + \frac{1.5(0.5)}{2!}(-0.04592527) + \frac{1.5(0.5)(-0.5)}{3!}(-0.00283871)$$

$$= -0.62049958 + 0.50476935 - 0.01722198 + 0.00001774 = \boxed{-0.13293446 \text{ est}}$$

actual $0.25 \cos(0.25) - 2(0.25)^2 + 3(0.25) - 1 = \boxed{-0.13277189}$

SECT 3.3

#1c

MATH/CSC 440 (3)

PROF. R.B. GOLDSSTEIN

CHAP 3 HW

B+F - 8th ed

Hermite Interpolation - Hermite.xls (Excel)

-0.5	<u>-0.0247500</u>	<u>0.7510000</u>			
-0.5	<u>-0.0247500</u>	1.4387500	2.7510000	1.0000000	
-0.25	<u>0.3349375</u>	<u>2.1890000</u>	3.0010000	1.0000000	-0.0000000
-0.25	<u>0.3349375</u>	3.0642500	3.5010000	1.0000000	0.0000000
0	<u>1.1010000</u>	<u>4.0020000</u>	3.7510000	1.0000000	
0	<u>1.1010000</u>				

(underlined are given values)

$$P_3(x) \approx f(x) \approx -0.02475 + 0.751(x+0.5) + 2.751(x+0.5)^2 + 1(x+0.5)^3(x+0.25)$$

#3c

$$f(x) = x^3 + 4.001x^2 + 4.002x + 4.01$$

$$f(-\frac{1}{3}) = \boxed{0.174518518}$$

$$P_3(-\frac{1}{3}) = -0.2475 + 0.751(-\frac{1}{3} + 0.5) + 2.751(-\frac{1}{3} + 0.5)^2 + 1(-\frac{1}{3} + 0.5)^3(-\frac{1}{3} + 0.25)$$

$$= -0.2475 + 0.125166666 + 0.076416666 - 0.002314814$$

$$= \boxed{0.174518518}$$

no error above