

**Problem 2b page 131**

x	f(x)				
0.1	-0.62049958				
0.2	-0.28398668	3.365129			
0.3	0.00660095	2.9058763	-2.2962635		
0.4	0.2484244	2.4182345	-2.438209	-0.473151667	

linear:  $L1(x) = -0.62049958 + 3.365129(x-0.1)$   
 quadratic:  $L2(x) = -0.62049958 + 3.365129(x-0.1) - 2.2962635(x-0.1)(x-0.2)$   
 cubic:  $L3(x) = -0.62049958 + 3.365129(x-0.1) - 2.2962635(x-0.1)(x-0.2) - 0.473151667(x-0.1)(x-0.2)(x-0.3)$

values:  $L1(0.25) = -0.11573023$   
 $L2(0.25) = -0.13295218$   
 $L3(0.25) = -0.132774749$

**Problem 5a page 131**

x	f(x)				
0	1				
0.2	1.2214	1.107			
0.4	1.49182	1.3521	0.61275		
0.6	1.82212	1.6515	0.7485	0.22625	
0.8	2.22554	2.0171	0.914	0.275833333	0.061979167

$L4(0.05) = 1.051258799$

0.05

**Problem 7 page 140**

x	f(x)	derivative values				
0	0					
0	0	75				
3	225	75	0			
3	225	77	0.666666667	0.222222222		
5	383	79	1	0.066666667	-0.031111111	
5	383	80	0.5	-0.25	-0.063333333	
8	623	80	0	-0.1	0.03	
8	623	74	-2	-0.666666667	-0.113333333	
13	993	74	0	0.25	0.114583333	
13	993	72	-0.4	-0.08	-0.04125	

**Continuation:**

-0.031111111					
-0.063333333	-0.006444444				
0.03	0.011666667	0.002263889			
-0.113333333	-0.028666667	-0.00504167	-0.000913194		
0.114583333	0.022791667	0.005145833	0.000783654	0.000130527	
-0.04125	-0.019479167	-0.00422708	-0.000937292	-0.00013238	

**Continuation:**

-2.02236E-05

**finished in Maple**

```

> ## Problem 7 page 140
> ## Continuation:
> x0:=0;
x1:=3;
x2:=5;
x3:=8;
x4:=13;
a0:=0;
a1:=75;
a2:=0;
a3:=0.222222222;
a4:=-0.031111111;
a5:=-0.006444444;
a6:=0.002263889;
a7:=-0.000913194;
a8:=0.000130527;
a9:=-0.0000202236;

H9:=x->a0+a1*(x-x0)+a2*(x-x0)^2+a3*(x-x0)^2*(x-x1)+
a4*(x-x0)^2*(x-x1)^2+
a5*(x-x0)^2*(x-x1)^2*(x-x2)+
a6*(x-x0)^2*(x-x1)^2*(x-x2)^2+
a7*(x-x0)^2*(x-x1)^2*(x-x2)^2*(x-x3)+
a8*(x-x0)^2*(x-x1)^2*(x-x2)^2*(x-x3)^2+
a9*(x-x0)^2*(x-x1)^2*(x-x2)^2*(x-x3)^2*(x-x4):
simplify(H9(x));

```

$x0 := 0$

$x1 := 3$

$x2 := 5$

$x3 := 8$

$x4 := 13$

$a0 := 0$

$a1 := 75$

$a2 := 0$

$a3 := 0.222222222$

$a4 := -0.031111111$

$a5 := -0.006444444$

$a6 := 0.002263889$

$a7 := -0.000913194$

$a8 := 0.000130527$

$a9 := -0.0000202236$

$75. x - 0.02187564600 x^7 + 7.161904260 x^2 - 10.09530361 x^3 + 5.508117381 x^4$   
 $- 1.538294606 x^5 + 0.2430410630 x^6 + 0.001040589000 x^8 - 0.00002022360000 x^9$

```
> dH9:=D(H9):  
simplify(dH9(x));  
evalf(H9(10));  
evalf(dH9(10));
```

$75. + 14.32380852 x + 0.008324712000 x^7 - 30.28591082 x^2 + 22.03246952 x^3$   
 $- 7.691473030 x^4 + 1.458246378 x^5 - 0.1531295220 x^6 - 0.0001820124000 x^8$

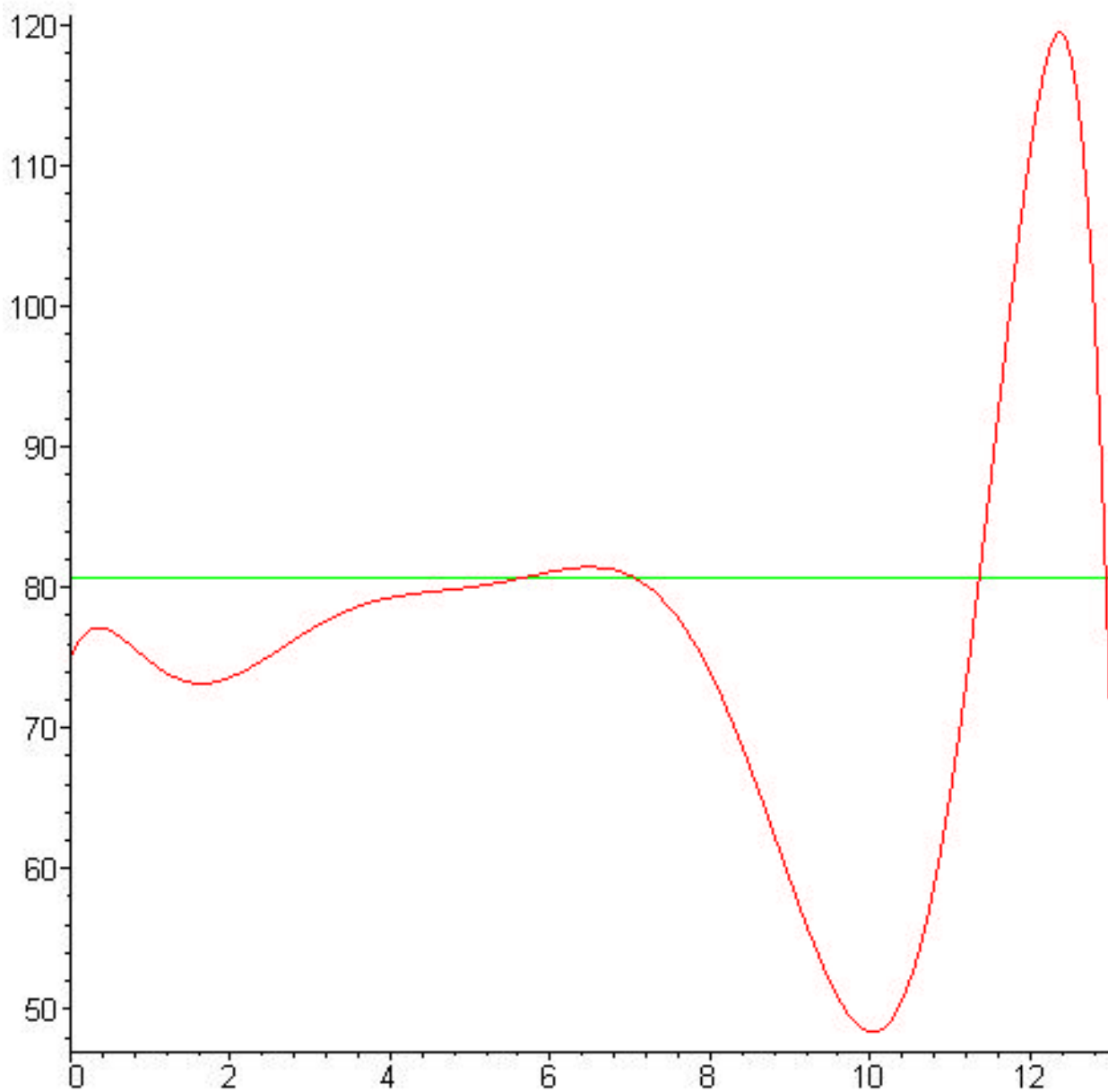
742.5030280

48.38202660

```
> ## 55 mi/h = 55* 5280 feet / 3600 sec  
evalf(55*5280/3600);
```

80.66666667

```
> plot([dH9,80.66666667],0..13);
```



```

> ## To find the first time the speed exceeds 55mi/h we solve
## dH9(x)=80.66666667 using Newton's method
## close to time 6 sec
d2H9:=D(dH9):
g:=x->evalf(x-(dH9(x)-80.66666667)/d2H9(x)):
x:=5.9;
for i from 1 to 3 do
x:=g(x);
od;

```

$x := 5.9$

$x := 5.643807884$

$x := 5.648806090$

$x := 5.648802676$

```
> ## Answer: The speed of 55 mi/h is first exceeded at t= 5.6488.  
## To find the maximum speed we solve d2H9(x)=0  
## using Newton method close to time 12  
d3H9:=D(d2H9):  
gg:=x->evalf(x-(d2H9(x))/d3H9(x)):  
x:=12;  
for i from 1 to 5 do  
x:=gg(x);  
od;
```

```
x := 12
```

```
x := 12.64532344
```

```
x := 12.42890015
```

```
x := 12.37498784
```

```
x := 12.37187974
```

```
x := 12.37186978
```

```
> ## Answer: The maximal speed is attained at t=12.3719  
## and equals:in feet/sec  
evalf(dH9(12.3719));
```

```
119.4220060
```

```
>
```