Q1: a) $y_5(x) = f(x_0) + (x-x_0)f[x_1,x_0] + (x-x_0)(x-x_1)f[x_2,x_1,x_0] + \dots$

$+ (x-x_0)(x-x_1)(x-x_2)(x-x_3)(x-x_4)f[x_4,x_3,x_2,x_1,x_0]$

	t	z	1st	2nd	3rd	4th
t_0	2	6				
t_1	2.1	767.752	17.52			
t_2	2.2	10.256	25.04	37.6		
t_3	2.7	36.576	52.64	46	12	
t_4	3	66	98.08	56.8	12	0
t_5	3.4	125.168	147.92	71.2	12	0

$z_5(x) = z(t_0) + (t-t_0)z[t_1,t_0] + (t-t_0)(t-t_1)z[t_2,t_1,t_0] + (t-t_0)(t-t_1)(t-t_2)$

$z[t_3,t_2,t_1,t_0] + (t-t_0)(t-t_1)(t-t_2)(t-t_3)z[t_4,t_3,t_2,t_1,t_0]$

$\Rightarrow z_5(x) = 6 + (t-2)(17.52) + (t-2)(t-2.1)(37.6) + (t-2)(t-2.1)(t-2.2)(12)$

$\Rightarrow z_5(2.5) = 23$

b) $f(x) = \frac{(x-x_2)(x-x_3)(x-x_4)}{(x_1-x_2)(x_1-x_3)(x_1-x_4)} 7.752 + \frac{(x-x_1)(x-x_3)(x-x_4)}{(x_2-x_1)(x_2-x_3)(x_2-x_4)} 10.256 + \frac{(x-x_1)(x-x_2)(x-x_4)}{(x_3-x_1)(x_3-x_2)(x_3-x_4)} 36.576 +$

$\frac{(x-x_1)(x-x_2)(x-x_3)}{(x_4-x_1)(x_4-x_2)(x_4-x_3)} 66$

$\Rightarrow f(x) = \frac{(x-x_2)(x-x_3)(x-x_4)}{(2.1-2.2)(2.1-2.7)(2.1-3)} 7.752 + (x$

$\Rightarrow f(x) = \frac{(x-2.2)(x-2.7)(x-3)}{(2.1-2.2)(2.1-2.7)(2.1-3)} 7.752 + \frac{(x-2.1)(x-2.7)(x-3)}{(2.2-2.1)(2.2-2.7)(2.2-3)} 10.256 +$

$\frac{(x-2.1)(x-2.2)(x-3)}{(2.7-2.1)(2.7-2.2)(2.7-3)} 36.576 + \frac{(x-2.1)(x-2.2)(x-2.7)}{(3-2.1)(3-2.2)(3-2.7)} 66$

$\Rightarrow f(2.5) = z(2.5) \Rightarrow z(2.5) = f(2.5) = 23$

~~$\Rightarrow f(y_1(3.5) = 3.125$~~

Q2: a) b) $y_6(x) = f(x_0) + (x-x_0)f[x_1,x_0] + (x-x_0)(x-x_1)f[x_2,x_1,x_0] + (x-x_0)(x-x_1)(x-x_2)f[x_3,x_2,x_1,x_0] + \dots$

	x	y	1st	2nd	3rd	
x_0	0	(26)	~~*~~			
x_1	1	15.5	(-10.5)			
x_2	2.5	5.375	-6.75	(1.5)		
x_3	3	3.5	-3.75	1.5	(0)	
x_4	4.5	2.375	-0.75	1.5	0	
x_5	5	3.5	2.25	1.5	0	
x_6	6	8	4.5	1.5	0	

$\Rightarrow y_6(x) = 26 - 10.5(x-0) + (x-0)(x-1)(1.5) + (x-0)(x-1)(x-2.5)(0)$

$\Rightarrow y_6(3.5) = 2.375$

Q2: b) $f(x) = \frac{(x-x_3)(x-x_4)(x-x_5)}{(x_2-x_3)(x_2-x_4)(x_2-x_5)} 5.375 + \frac{(x-x_2)(x-x_4)(x-x_5)}{(x_3-x_2)(x_3-x_4)(x_3-x_5)} 2.5 + \frac{(x-x_2)(x-x_3)(x-x_5)}{(x_4-x_2)(x_4-x_3)(x_4-x_5)} 3.5 + \frac{(x-x_2)(x-x_3)(x-x_4)}{(x_5-x_2)(x_5-x_3)(x_5-x_4)} 2.375$

$\Rightarrow f(x) = \frac{(x-3)(x-4.5)(x-5)}{(2.5-3)(2.5-4.5)(2.5-5)} 5.375 + \frac{(x-2.5)(x-4.5)(x-5)}{(3-2.5)(3-4.5)(3-5)} 2.5 + \frac{(x-2.5)(x-3)(x-5)}{(4.5-2.5)(4.5-3)(4.5-5)} 3.5 + \frac{(x-2.5)(x-3)(x-4.5)}{(5-2.5)(5-3)(5-4.5)} 2.375$

$\Rightarrow f(3.5) = 2.375$

Q3:

x	0	1	2.5	3	4.5	5	6
y	26	15.5	5.375	3.5	2.375	3.5	8

Using Newton interpolating polynomial to determine y at $x = 3.5$

as in Q1 we have: $y(3.5) = 2.375$

Ngày ..... Tháng ..... Năm.....

Divided difference table

0^{th} order $f[x_0] = f(x_0) = 26$

1^{st} order $f[x_1, x_0] = \dfrac{f[x_1] - f[x_0]}{x_1 - x_0} = \dfrac{15.5 - 26}{1 - 0} = -10.5$

2^{nd} order $f[x_2, x_1, x_0] = f[$

	x	y	1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}	6^{th}
x_0	0	26	-10.5					
x_1	1	15.5	-6.75	1.5				
x_2	2.5	5.375	-3.75	1.5	0			
x_3	3	3.5	-0.75	1.5	0	0		
x_4	4.5	2.375	2.25	1.5	0	0	0	0
x_5	5	3.5	4.5	1.5	0	0	0	
x_6	6	8						