x	$f(x)$	D'	D''	D'''	D'''
1	0				
		$\dfrac{19-0}{2-1}=19$			
2	19		$\dfrac{51-19}{3-1}=16$		
		$\dfrac{70-19}{3-2}=51$		$\dfrac{25-16}{4-1}=3$	
3	70		$\dfrac{101-51}{4-2}=25$		$\dfrac{3-3}{5-1}=0$
		$\dfrac{171-70}{4-3}=101$		$\dfrac{34-25}{5-2}=3$	
			$\dfrac{169-101}{5-3}=34$		$\dfrac{3-3}{6-2}=0$
4	171			$\dfrac{43-34}{6-3}=3$	
		$\dfrac{340-171}{5-4}=169$			
			$\dfrac{255-169}{6-4}=43$		
5	340				
		$\dfrac{595-340}{6-5}=255$			
6	595				

○

$$s = \dfrac{2 \cdot 5 - 1}{1} = 1.5$$

$$P(2.5) = 0 + 1.5(19) + \dfrac{1.5(1.5-1)16}{2!} + \dfrac{1.5(1.5-1)(1.5-2)3}{3!}$$

$$28.5 + 6 + (-0.1875)$$

$$= 34.3125$$

(b) $f(x) = \sin x$ at $x = 0$, hence find $\sin -0.1$

$$f(x) = f(x_0) + f'(x_0)(x-x_0) + \frac{f''(x_0)}{2!}(x-x_0)^2 + \frac{f'''(x_0)}{3!}(x-x_0)^3 + \cdots$$

$f(x) = \sin x$ $f(0) = \sin(0) = 0$

$f'(x) = \cos x$ $f'(0) = \cos(0) = 1$

$f''(x) = -\sin x$ $f''(0) = -\sin(0) = 0$

$f'''(x) = -\cos(x)$ $f'''(0) = -\cos(0) = -1$

$f''''(x) = \sin(x)$ $f''''(0) = \sin(0) = 0$

$P(x) = 0 + x + \frac{0x^2}{2!} - \frac{x^3}{3!}$

$= x - \frac{x^3}{6}$

$\sin(0.1) = p(0.1)$

$0.1 - \frac{(0.1)^3}{6}$

$= 0.099833$

i) $L_0(x) = \dfrac{(x-2)(x-3)}{\cancel{2+\cancel{-3}}} = -\dfrac{(x-2)(x-3)}{2}$

$\dfrac{}{(1-2)(1-3)}$

-2

$L_1(x) = \dfrac{(x-1)(x-3)}{(2-1)(2-3)} = \dfrac{(x-1)(x-3)}{-1}$

$L_2(x) = \dfrac{(x-1)(x-2)}{(3-1)(3-2)} = \dfrac{(x-1)(x-2)}{2}$

$P_2(x) = 5\,L_0(x) + 15\,L_1(x) + 31\,L_2(x)$

$P_2(x) = 5 \cdot \dfrac{(x-2)(x-3)}{2} + 15 \cdot \dfrac{(x-1)(x-3)}{-1} + 31 \cdot \dfrac{(x-1)(x-2)}{2}$

$5 \cdot \dfrac{x^2 - 5x + 6}{2} = \dfrac{5x^2 - 25x + 30}{2}$

$15 \cdot \dfrac{-(x^2 - 4x + 3)}{1} = -15x^2 + 60x - 45$

$31 \cdot \dfrac{x^2 - 3x + 2}{2} = \dfrac{31x^2 - 93 + 62}{2}$

$P_2(x) = \dfrac{5x^2 - 25x + 30}{2} - 15x^2 + 60x - 45 + \dfrac{31x^2 - 93x + 65}{2}$

$P_2(x) = \dfrac{5x^2 - 25x + 30 + 31x^2 + 93x + 62}{2} - 15x^2 + 60x - 45$

$P_2(x) = \dfrac{36x^2 - 118x + 92}{2} - 15x^2 + 60x - 45$

$P_2(x) = 18x^2 - 59x + 46 - 15x^2 + 60x - 45$

$P_2 = 3x^2 + x + 1$

$P(2.5) = 3(2.5)^2 + 2.5) + 1$

$= 22.25$