

السؤال الأول (20 درجة)

$$f'(x) = 6x^5 - 1$$

$$x_2 = x_1 - \frac{f(x_1)}{f'(x_1)} = 1.135 \quad (4.5)$$

$$x_4 = x_3 - \frac{f(x_3)}{f'(x_3)} = 1.135 \quad (e_{\text{rel}} > 5)$$

$$y_{n+1} = y_n + \frac{1}{6} [k_1 + 2k_2 + 2k_3 + k_4]$$

(b Marks)

x_n	y_n	k_1	k_2	k_3	k_4
0	-1	0.5	0.355	0.391	0.264
0.1	-0.624	0.2719	0.184	0.206	0.129
0.2	-0.427				

(10 Marks)

(10 Marks)

5

السؤال الثاني (20 نقطة)

$$n = \frac{b-a}{h} = 4$$

$$\int_0^2 \frac{dx}{3x^2+2} = \frac{b-a}{n} [f(x_0) + f(x_1) + \dots + f(x_n)]$$

x	0	0.5	1	1.5	2
$f(x)$	0.5	0.364	0.2	0.114	0.071

(15 Marks)

$$\int_0^2 \frac{dx}{3x^2+2} = 0.5 [0.5 + 0.364 + 0.2 + 0.114] = 0.599$$

(5 Marks)

السؤال الثالث (30 نقطة)

$$S = \sum_{i=1}^N (v(t_i) - v_i)^2 = \sum_{i=1}^N (at_i + v_0 - v_i)^2$$

$$\frac{\partial S}{\partial v_0} = \sum_{i=1}^N 2(at_i + v_0 - v_i) = 0$$

$$\frac{\partial S}{\partial a} = \sum_{i=1}^N 2(at_i + v_0 - v_i)t_i = 0$$

(5 Marks)

$$Nv_0 + a \sum_{i=1}^N t_i = \sum_{i=1}^N v_i \quad (1)$$

$$v_0 \sum_{i=1}^N t_i + a \sum_{i=1}^N t_i^2 = \sum_{i=1}^N v_i t_i \quad (2)$$

(5 Marks)

$$N=10, \quad \sum_{i=1}^{10} t_i = 9.19, \quad \sum_{i=1}^{10} v_i = 91.18$$

$$\sum_{i=1}^{10} v_i t_i = 116.808, \quad \sum_{i=1}^{10} t_i^2 = 11.82$$

(15 Marks)

$$10v_0 + 9.19a = 91.18 \quad (1)$$

$$9.19v_0 + 11.82a = 116.808 \quad (2)$$

$$a = 9.798 \text{ m/s}^2$$

$$v_0 = 0.114 \text{ m/s}$$

(5 Marks)