Multiple-Choice Test

Newton's Divided Difference Method of Interpolation

1. If a polynomial of degree n has $n+1$ zeros, then the polynomial is
   (A) oscillatory
   (B) zero everywhere
   (C) quadratic
   (D) not defined.

2. The following x-y data is given.

x	15	18	22
y	24	37	25

   The Newton's divided difference second order polynomial for the above data is given by
   $$b_0 + b_1(x-15) + b_2(x-15)(x-22)$$
   The value of b_1 is most nearly
   (A) -1.048
   (B) 0.1433
   (C) 4.333
   (D) 24.00

3. The polynomial that passes through the following x-y data

x	18	22	24
y	?	25	123

   is given by
   $$8.125x^2 - 324.75x + 3237, 18 \le x \le 24.$$
   The corresponding polynomial using Newton's divided difference polynomial is given by

   $$b_0 + b_1(x-18) + b_2(x-18)(x-22)$$
   The value of b_2 is

   (A) 0.2500
   (B) 8.125
   (C) 24.00
   (D) not obtainable with the information given

4. Velocity vs. time data for a body is approximated by a second order Newton's divided difference polynomial as

$$v(t) = b_0 + 39.622(t - 20) + 0.5540(t - 20)(t - 15), 10 \le t \le 20$$

The acceleration at $t = 15$ is
        (A) $0.5540 m / s^2$
        (B) $39.622 m / s^2$
        (C) $36.852 m / s^2$
        (D) not obtainable with the given information

5. A robot is following a path on a x-y plane is found by interpolating four data points as

x	2	4.5	5.5	7
y	7.5	7.5	6	5

$$y(x) = 0.1524 x^3 - 2.257 x^2 + 9.605 x - 3.900$$

The length of the path from $x=2$ to $x=7$ is

(A) $\sqrt{(7.5 - 7.5)^2 + (4.5 - 2)^2} + \sqrt{(6 - 7.5)^2 + (5.5 - 4.5)^2} + \sqrt{(5 - 6)^2 + (7 - 5.5)^2}$

(B) $\int_2^7 \left[\sqrt{1 + (0.1524 x^3 - 2.257 x^2 + 9.605 x - 3.900)^2} \right] dx$

(C) $\int_2^7 \sqrt{1 + (0.4572 x^2 - 4.514 x + 9.605)^2} \, dx$

(D) $\int_2^7 (0.1524 x^3 - 2.257 x^2 + 9.605 x - 3.900) dx$

6. The following data of the velocity of a body as a function of time is given

Time (s)	0	15	18	22	24
Velocity(m/s)	22	24	37	25	123

If you were going to use quadratic interpolation to find the value of the velocity at t=14.9 seconds, the three data points of time you would choose for interpolation are
        (A) 0, 15, 18
        (B) 15, 18, 22
        (C) 0, 15, 22
        (D) 0, 18, 24.

For answers, take the test online at
http://numericalmethods.eng.usf.edu/mcquizzes/05inp/ndd.html