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Dprtmt f Mthmtcs, VT hpl Uvrsty

ppld Nmrcl Mthds (MT23)

**Prblm St-4**

**Numerical Differentiation and Integration**

**--------------------------------------------------------------------------------------------**

1. From the table below, for what value of , is minimum? Also find this value of

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

1. A slider in a machine moves along a fixed straight rod. Its distance (in cm.) along the rod is given al various time (in secs.)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Estimate at and .

1. A rod is rotating in a plane. The following table gives the angle (radians) through which the rod has turned for various values of time (seconds).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |

Calculate the angular velocity and acceleration of the rod when sec.

1. The table given below reveals the velocity of a body during the time specified. Find its acceleration at

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

1. Given

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

1. Find
2. Find
3. The population of a certain town is given below. Find the rate of growth of the population in from the following table:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
| (thousands) |  |  |  |  |  |

Estimate the population in the years and . Also find the rate of the growth of the population in

1. The following data gives corresponding value of pressure and specific volume of a superheated steam:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Find the rate of change of

1. pressure with respect to volume when
2. volume with respect to pressure when
3. A rocket is launched from the ground. Its acceleration is registered during the first seconds and is given in the table below. Using Simpson’s one-third rule, find the velocity of the rocket at seconds.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| (sec) |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

1. Evaluate using trapezoidal rule
3. Use Simpson’s rule dividing the range into ten equal parts to show that
4. The velocity of a particle at distance from a point on its linear path is given by the following table:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

Estimate the time taken by the particle to traverse the distance of meter.

1. A river is meters wide. The depth in meters at a distance meters from one bank is given by the following table:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

Find approximate area of cross-section.

1. The velocity of a train which starts from rest is given by the following table, the time being recorded in minutes from start and speed in kmph:

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |

Find the approximate total distance in minutes run by the train by Simpson’s rule.

1. A reservoir discharging water through sluices at a depth below the water surface has a surface area for various values of as given below:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

If denotes time in minutes, the rate of fall of the surface is given by Estimate the time taken for the water level to fall from to feet above the sluices.

1. Evaluate using the Romberg’s method. Hence obtain an approximate value of
2. Apply Romberg’s method to estimate , given that

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |