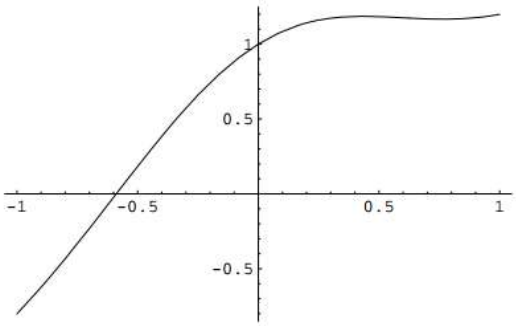
UNIVERSITY OF PETROLEUM & ENERGY STUDIES, DEHRADUN

Program	B.Tech (All SoCSBranches)	Semester	I
Course	Engineering Mathematics	Course Code	MATH 1036

1. The approximate population of the U.S. was 150.7 million in 1950, 179.3 million in 1960, 203.3 million in 1970, 226.5 million in 1980, and 249.6 million in 1990. Using Newton's interpolation polynomial for these data, find an approximate value for the population in 1952.
2. If $y = x^3 + x^2 - 2x + 1$, calculate values of y for $x = 0,1,2,3,4,5$ and form the difference table.
3. Find the root of the function $x + e^{-x^2}\cos(x)$, whose graph is shown below:



4. Using Newton's method show that the iteration scheme for finding the fourth root of a number N is given by $x_{i+1} = \frac{1}{4}\left(3x_i + \frac{N}{{x_i}^3}\right)$.
5. A train is moving at the speed of 30m/s. Suddenly brakes are applied. The speed of thee train per second after t seconds is given by

Time(t)	0	5	10	15	20	25	30
Speed(v)	30	24	19	16	13	11	10

Apply Simpson's three-eighth rule to determine the distance moved by the train in 30 seconds.

6. Evaluate $\int_0^1 \frac{1}{1+x^2}dx$ by dividing the interval of integration into 8 equal parts.

7. Solve the system

$$6x_1 + x_2 + x_3 = 20$$
$$x_1 + 4x_2 - x_3 = 6$$
$$x_1 - x_2 + 5x_3 = 7.$$

8. Given the differential equation $\frac{dy}{dx} = \frac{x^2}{y^2+1}$ with the initial condition $y = 0$ when $x = 0$, Use Picard's method to obtain y for $x = 0.25,\ 0.5$ and 1.0 correct to three decimal places.

9. Solve, the problem

   $\frac{dy}{dx} = x + y$, $y(0) = 0$. Choose$h = 0.2$ and compute $y(0.2)$ and $y(0.4)$.

10. Find the positive root of $x^4 - x = 10$ correct to three decimal places, using Newton-Raphson method.