Department of Applied Mechanics, IIT Delhi
AML-702 Applied Computational Methods (2019-2020 II Sem)
Minor Test #1
06 Feb 20, 2:30 pm to 3:30 pm, Room LH-604
Maximum marks: 15

1. The upward velocity of a rocket is given at three different times in the following table:

Time, t (s)	Velocity, v (m/s)
5	106.8
8	177.2
12	279.2

The velocity data is approximated by a polynomial as
$$v(t) = a_1 t^2 + a_2 t + a_3, \qquad 5 \le t \le 12$$
The coefficients a_1, a_2, and a_3 for the above expression are given by
$$25a_1 + 5a_2 + a_3 = 106.8$$
$$64a_1 + 8a_2 + a_3 = 177.2$$
$$144a_1 + 12a_2 + a_3 = 279.2$$

(a) Find the values of a_1, a_2, and a_3 using the Naïve Gauss elimination method.
(b) Find the velocity at $t = 6, 11$ seconds.

[6 + 2 = 8]

2. Find third order accurate Taylor series for (a) $f(x) = \dfrac{1}{(1+x)^2}$ and (b) $f(x) = \sin x$

[1.5 + 1.5 = 3]

3. (a) Using suitable sketches and mathematical expressions briefly describe key features of the Secant method used as root finding formula.

(b) Use the Newton Raphson method to find the only real root of the equation $x^3 - x - 1 = 0$. Use the interval x = 1 and x = 2 and perform three iterations.

[2 + 2 = 4]