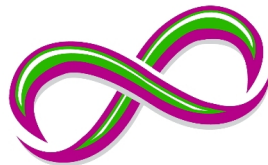


Infinity Tutors

Empowering Academic Excellence

Advanced Mechanics and Kinetic Theory of Gases



Infinity Tutors

July 27, 2025

PROBLEMS

A.1

The motion of a particle is defined by the relation $x = 1.5t^4 - 30t^2 + 5t + 10$, where x and t are expressed in meters and seconds, respectively. Determine the position, the velocity, and the acceleration of the particle when $t = 4$ s.

A.2

The motion of a particle is defined by the relation $x = 12t^3 - 18t^2 + 2t + 5$, where x and t are expressed in meters and seconds, respectively. Determine the position and the velocity when the acceleration of the particle is equal to zero.

A.3

The motion of a particle is defined by the relation $x = \frac{5}{3}t^3 - \frac{5}{2}t^2 - 30t + 8$, where x and t are expressed in feet and seconds, respectively. Determine the time, the position, and the acceleration when $v = 0$.

A.4

The motion of a particle is defined by the relation $x = 6t^2 - 8 + 40 \cos \pi t$, where x and t are expressed in inches and seconds, respectively. Determine the position, the velocity, and the acceleration when $t = 6$ s.

A.5

The motion of a particle is defined by the relation $x = 6t^4 - 2t^3 - 12t^2 + 3t + 3$, where x and t are expressed in meters and seconds, respectively. Determine the time, the position, and the velocity when $a = 0$.

A.6

The motion of a particle is defined by the relation $x = 2t^3 - 15t^2 + 24t + 4$, where x is expressed in meters and t in seconds. Determine (a) when the velocity is zero, (b) the position and the total distance traveled when the acceleration is zero.

A.7

The motion of a particle is defined by the relation $x = t^3 - 6t^2 - 36t - 40$, where x and t are expressed in feet and seconds, respectively. Determine (a) when the velocity is zero, (b) the velocity, the acceleration, and the total distance traveled when $x = 0$.

A.8

The motion of a particle is defined by the relation $x = t^3 - 9t^2 + 24t - 8$, where x and t are expressed in inches and seconds, respectively. Determine (a) when the velocity is zero, (b) the position and the total distance traveled when the acceleration is zero.

A.9

The acceleration of a particle is defined by the relation $a = -8 \text{ m/s}^2$. Knowing that $x = 20 \text{ m}$ when $t = 4 \text{ s}$ and that $x = 4 \text{ m}$ when $v = 16 \text{ m/s}$, determine (a) the time when the velocity is zero, (b) the velocity and the total distance traveled when $t = 11 \text{ s}$.

A.10

The acceleration of a particle is directly proportional to the square of the time t . When $t = 0$, the particle is at $x = 24 \text{ m}$. Knowing that at $t = 6 \text{ s}$, $x = 96 \text{ m}$ and $v = 18 \text{ m/s}$, express x and v in terms of t .

Answers to Questions and Submit your work to TJ on Tuesday