

Physics 1135 Homework for Recitation 1: Math review, 1-d Kinematics.

I. Math Review

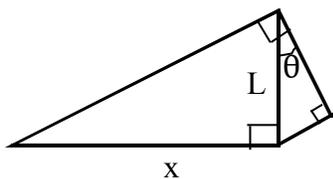
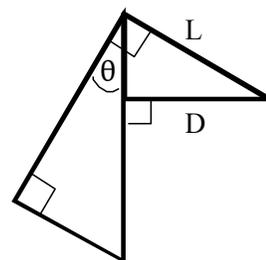
1. Solve the system of equations for A :

$$\begin{aligned}7A - 5B &= -1 \\ B + A &= 5\end{aligned}$$

2. Solve the system of equations for C :

$$\begin{aligned}A + 3C &= 9 \\ 5C - 2A &= 4\end{aligned}$$

3. Two similar right triangles are perpendicular to one another, as shown in the figure at right. Express the length L in terms of length D and angle θ .



4. Two right triangles share a side of length L as shown in the figure. Express the length x in terms of L and θ .

5. Calculate the derivative of $f(x)$ with respect to x for the following functions:

a) $f(x) = 2x^{-3}$

b) $f(x) = 2x \sin(5x^2)$

6. Calculate the indefinite integral $\int f(x) dx$ for the following functions:

a) $f(x) = \frac{1}{x^2}$

b) $f(x) = x^7$

II. 1-d Kinematics: Relationship between position, velocity, and acceleration

1. A particle is moving along the x -axis. Its position as a function of time is given as

$$x = bt - ct^2.$$

- What must be the units of the constants b and c , if x is in meters and t in seconds?
- At time zero the particle is at the origin. At what later time t does it pass the origin again?
- Derive an expression for the x - component of velocity.
- At what time t is the particle momentarily at rest?
- Derive an expression for the x -component of the particle's acceleration, a_x .

2. A particle is moving along the x -axis. Its acceleration is given by $a_x = ct - dt^2$

with $c=2.0\text{m/s}^3$ and $d=0.24\text{m/s}^4$. The particle is at rest at the origin at $t=0$. Find position and velocity as functions of time. What is the maximum velocity the particle reaches?

3. The figure shows position vs time graphs for two horses.

- Sketch velocity vs time graphs for each of the horses.
- Do the horses ever have the same speed? Where?
- Does horse A ever passes horse B? If so, indicate at which point in time.
- Does horse B ever passes horse A? If so, indicate at which point in time.

