

Question 1:

The coordinates of an object moving in the xy plane vary with time according to the equations $x = 3t - 4$ and $y = t^3 + 3t - 7$, where x and y in meters, and t in seconds.

Determine:

- a) the vector position \vec{r} at $t=2s$
- b) the vector velocity \vec{v} at $t=2s$.
- c) the speed at $t=2s$
- d) the vector acceleration \vec{a} at $t=2s$

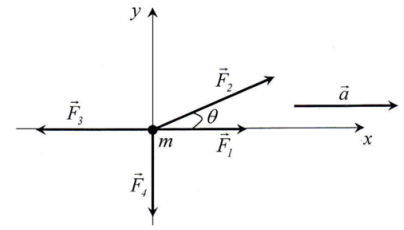


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Question 2:

The free body diagram of a block of mass $m=2\text{kg}$ is shown in figure. The magnitudes of certain forces are given as follow: $F_1 = 12\text{N}$, $F_3 = 15\text{N}$ and $F_4 = 10\text{N}$. The angle between \vec{F}_1 and \vec{F}_2 is $\theta = 30^\circ$. By using the Newton's second law, find

- the magnitude of the force \vec{F}_2 ($F_2 = ??$) and
- the magnitude of the acceleration \vec{a} ($a = ??$)

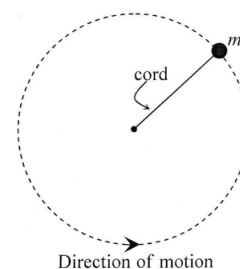


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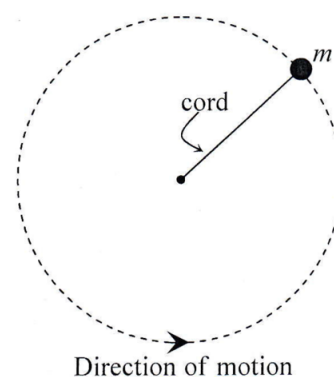
Question 3:

A ball of mass m is attached to the end of a cord whose length is $r=0.8\text{m}$. The ball is whirled a horizontal circle with a constant speed $v=4\text{m/s}$. The cord withstands a tension of magnitude $T=30\text{N}$.

a) Calculate the mass of the ball.



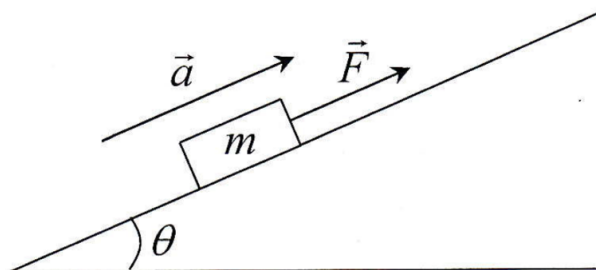
b) Show in figure the direction of the vector velocity \vec{v} , and the direction of the vector centripetal acceleration \vec{a}_c .



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Question 4:

A block is pulled on a rough inclined plane by a force F as shown in figure. Show the free body diagram of the block.



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