

Your solutions should be neat, correct and complete. Full credit is not necessarily attained from the correct answer, you can lose points if the solution is not readable. Your solution should be readable to someone who has not read the problem statement. If I have to think about what your calculation means then its not complete. Numerical answers must be given in scientific notation for credit to be awarded. Missing or incorrect units on your answer automatically deducts $\frac{1}{2}$ of the credit. Finally, the answer must be boxed when there is a particular answer to find. Derivation problems are exceptions to this rule.

Recommended Homework from Textbook: problems

1.6, 1.7, 1.31, 1.34, 1.39, 1.43, 1.48, 1.66, 1.72, 1.82, 1.90.

Naturally, I also recommend you work on understanding whatever details of lecture seem mysterious at first.

Required Reading 1 [1pt] Your signature below indicates you have read:

(a.) I read Lectures 1, 2, 3 and 4 by Cook as announced in Blackboard: _____.

(b.) I read Chapter 1 of the required text: _____.

Problem 1 [3pts] Let x, v, M, t be position, speed, mass and time for a particular object. Also, suppose a force $\vec{\mathbf{F}}$ has components described by $\vec{\mathbf{F}} \cdot \hat{\mathbf{x}} = ax$, $\vec{\mathbf{F}} \cdot \hat{\mathbf{y}} = bv^2$ and $\vec{\mathbf{F}} \cdot \hat{\mathbf{z}} = \frac{cM}{t}$. What are the SI-units of the constants a, b, c ? You may leave your answer in terms of meters (m), kilograms (kg) and seconds (s).

Problem 2 [3pts] A triangle has area 3 and one of the sides has length 1 with an adjacent angle of 40° . What are the lengths and remaining angles in this triangle? Please draw a triangle with all the answers clearly written.

Problem 3 [3pts] Let $\vec{\mathbf{A}} = \langle 1, 2, 2 \rangle$ and $\vec{\mathbf{B}} = \langle 0, -1, 3 \rangle$. Find $A, B, \hat{\mathbf{A}}, \hat{\mathbf{B}}$ and the angle between the vectors.

Problem 4 [3pts] A triangle PQR is formed by the triple of points $P = (1, 1, 1)$ and $Q = (0, 2, 0)$ and $R = (3, 2, 7)$. Find the lengths and angles of this triangle. Present your answer as a picture with the sides and angles labeled neatly (you do not need to draw it to scale or perspective, the purpose of the triangle is merely to clearly communicate your conclusions)

Problem 5 [3pts] A $300.0N$ force $\vec{\mathbf{F}}_A$ is directed due west. Second, a $200.0N$ force $\vec{\mathbf{F}}_B$ is directed at a standard angle of 165° . A third force $\vec{\mathbf{F}}_C$ also acts on the mass in question such that

$$\vec{\mathbf{F}}_A + \vec{\mathbf{F}}_B + \vec{\mathbf{F}}_C = (50.0N)\hat{\mathbf{u}}$$

where the unit-vector is in the direction of the vector $\hat{\mathbf{x}} + 3\hat{\mathbf{y}}$. Calculate the magnitude and standard angle of $\vec{\mathbf{F}}_C$.

Problem 6 [3pts] A ninja wanders through a dense cloud of hidden mist. He takes 40 steps northeast, then 80 steps 60° north of west, then 50 steps due south. Assuming he is facing due south at the end, tell him by what angle he should rotate **Counter-Clock-Wise(CCW)** before walking straight to return to his initial starting point. Also, how many steps should will he need to return to the starting point? (answers of the form, hes a ninja so he can just jump, glide, etc whatever, will be amusing, but will not earn points)

Problem 7 [3pts] Let $\vec{\mathbf{B}}$ be vector of magnitude 30 which makes an angle of 40° with the positive x -axis and an angle of 30° with the negative z -axis. Find the explicit Cartesian form of $\vec{\mathbf{B}}$ (if there are many possible answers then parametrize the solution set by an appropriate variable)

Problem 8 [3pts] Suppose $\vec{r} = \langle x, y, z \rangle$ and $x = 2^t$, $y = t \sin(t^2)$ and $z = \frac{2t}{1+t^4}$. Calculate the following:

(a.) $\frac{d\vec{r}}{dt}$

(b.) $\int \vec{r} dt$

Problem 9 [3pts] Let \vec{A} be a vector for which $A = 3$ for all time t . Show that \vec{A} is perpendicular to $\frac{d\vec{A}}{dt}$ at all times.

Problem 10 [3pts] Calculate the projection of $\vec{v} = \langle 1, 1, 1 \rangle$ onto the vector $\vec{w} = 2\hat{y} - \hat{z}$. Write \vec{v} as a sum of a vector which is colinear to \vec{w} and another vector which is orthogonal to \vec{w} .