Physics 1A, Section 2

October 11, 2010

Quiz #1

- Was due 3 hours ago.

Main Purposes of Dot and Cross Products in Mechanics

- Dot product
  - projected components of a vector
  - product where the result is a scalar

    energy imparted = **force** · **distance**
- Cross product
  - (area of a parallelogram)
  - vector perpendicular to a plane
  - product where the result is a vector

    torque = **radius** × **force**

Quiz Problem 18

QP 18

Problem 2 (3 points)

What is the angle between two intersecting body diagonals of a cube? Give a numerical answer in degrees. (A *body diagonal* connects two corners and passes through the center of the cube).

Quiz Problem 18

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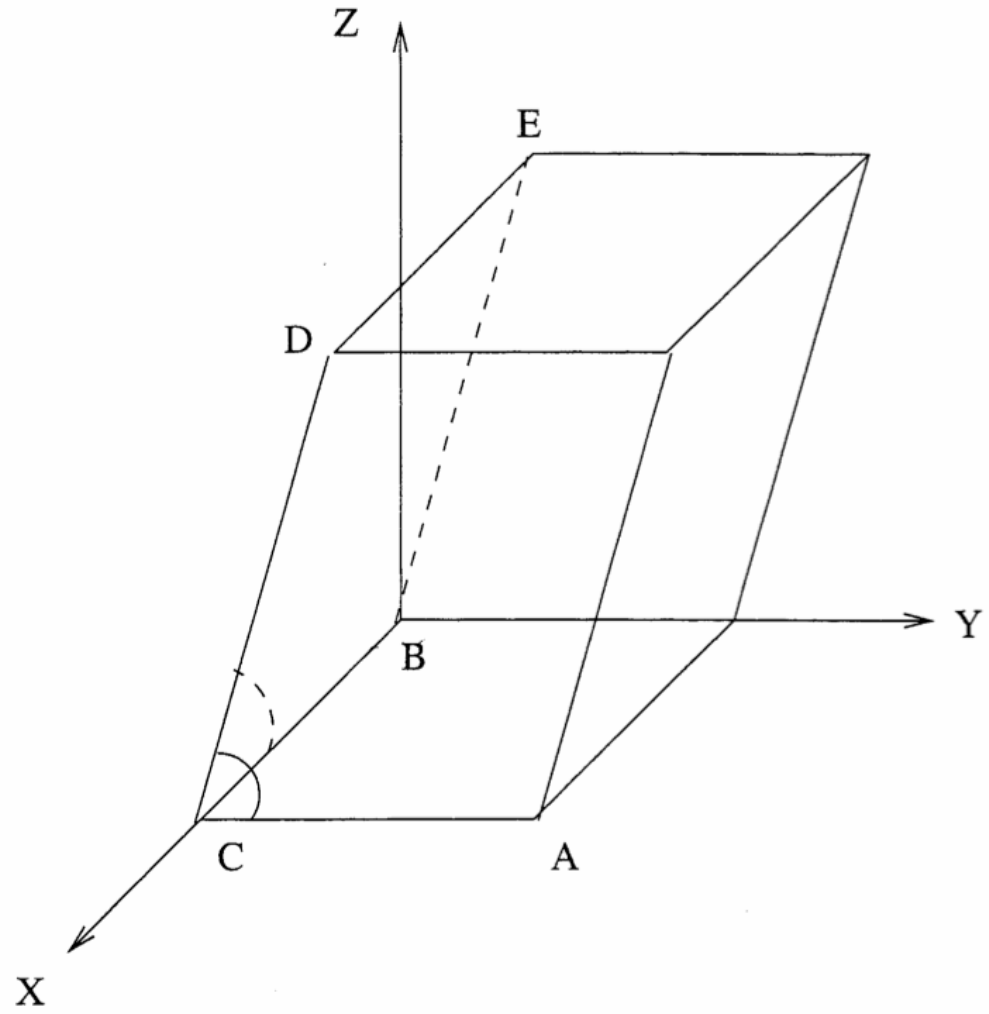
Problem 2 (3 points)

What is the angle between two intersecting body diagonals of a cube? Give a numerical answer in degrees. (A *body diagonal* connects two corners and passes through the center of the cube).

- Answer:
  a) $\cos^{-1}(1/3) = 70.5°$

Quiz Problem 27

A prism has its square base of side $4\,cm$ in the XY plane. Its top is $10\,cm$ heigher than the base, but offset $2\,cm$ in the $\hat{y}$ direction.

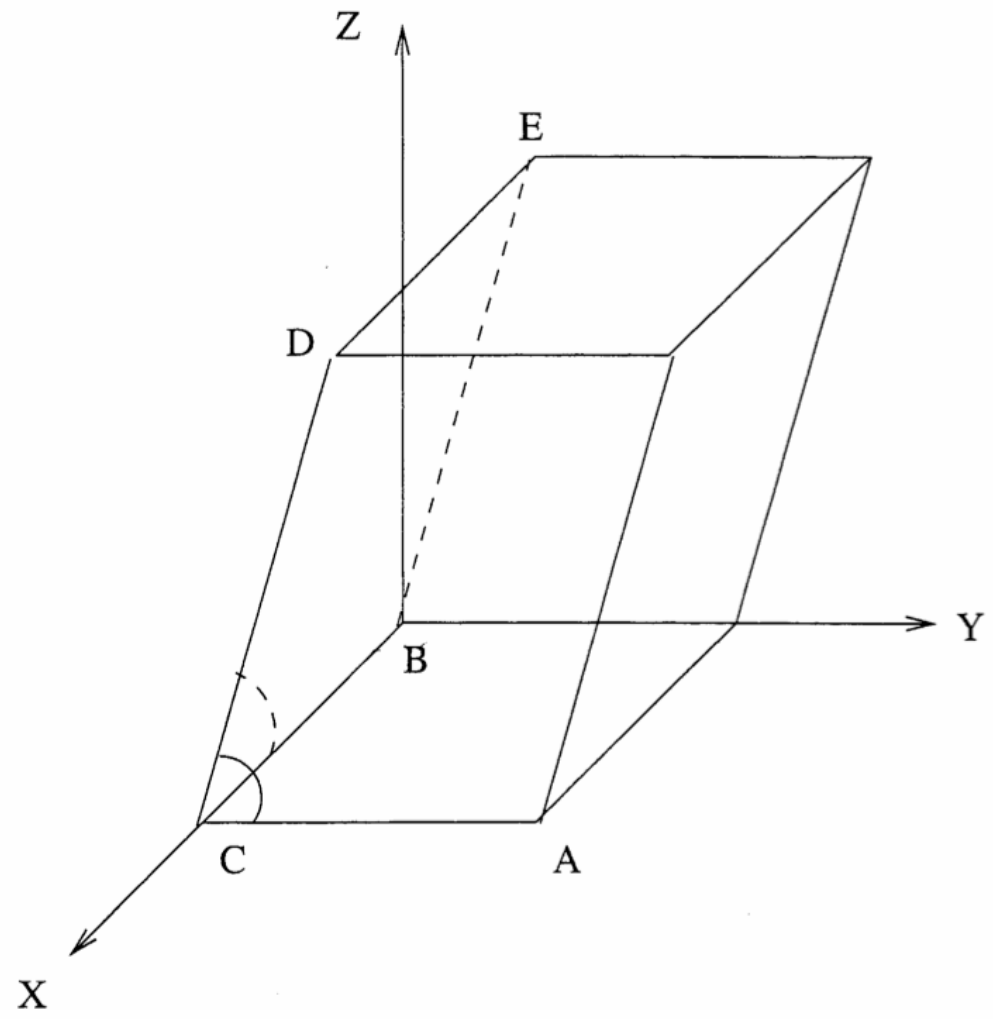


(a) **(2 points)** What are the two angles, ACD and BCD, between the edges of the prism?

(b) **(1 point)** Find the outward unit normal vector to the side $BCDE$.

Quiz Problem 27

A prism has its square base of side 4 cm in the XY plane. Its top is 10 cm heigher than the base, but offset 2 cm in the $\hat{y}$ direction.



(a) (2 points) What are the two angles, ACD and BCD, between the edges of the prism?

(b) (1 point) Find the outward unit normal vector to the side $BCDE$.

- Answer:
  - a) $\cos(\angle ACD) = \sqrt{26} / 26 \Rightarrow$
    $\angle ACD = 78.7°$
    $\cos(\angle BCD) = 0 \Rightarrow$
    $\angle BCD = 90°$
  - b) unit normal =
    $(\sqrt{26} / 26)\ (0, -5, 1)$

Thursday, October 14:

- Frautschi Problems 6.1 – 6.6
- Final Problem 9

- *Optional, but helpful, to look at these in advance.*

- Determinant of matrix:

  $\det(A) = \Sigma^{N}_{j=1} A_{i,j} (-1)^{i+j} M_{i,j}$

  $M_{i,j}$ = determinant of matrix after removing row i and column j