MATH 202 Name : SOLUTIONS

Quiz 1 January 27, 2012

Instructions: All questions are worth 1 point. You get one point for taking this quiz.

1. An object is located at the point $P(2, 0, -1)$, but is constrained so that it can only move in the straight-line direction toward the point $Q(0, 1, 3)$.

   (a) Give, in coordinate form, a vector $\mathbf{v}$ representing the direction in which the object can move.

   $\vec{v} = \vec{PQ} = \vec{Q} - \vec{P} = \langle 0,1,3\rangle - \langle 2,0,-1\rangle = \boxed{\langle -2,+1,+4\rangle}$

   (b) Give, in coordinate form, a *unit* vector pointing in the direction that the object can move.

   $\vec{u} = \dfrac{\vec{v}}{\|\vec{v}\|}$ $\quad \|\vec{v}\| = \sqrt{(-2)^2+(1)^2+4^2} = \sqrt{4+1+16} = \sqrt{21}$

   $\therefore \boxed{\vec{u} = \dfrac{1}{\sqrt{21}}\langle -2,1,4\rangle}$

2. (a) Determine if the vectors $\mathbf{v}_1 = (-1, 3, 7)$ and $\mathbf{v}_2 = (-2, -3, 1)$ are perpendicular.

   $\vec{v}_1 \cdot \vec{v}_2 = -1(-2) + 3(-3) + 7(1) = 2 - 9 + 7 = 0$

   Since the dot product is zero, the vectors are orthogonal.

   (b) Determine if the vectors $\mathbf{a} = (-4, 3, 12)$ and $\mathbf{b} = (-1, 1, 4)$ are parallel.

If $\vec{a}$ and $\vec{b}$ were parallel, then $\vec{a} = c\vec{b}$ for some non-zero scalar c.

That is, $(-4,3,12) = (-c, c, 4c)$. Equating components:

$-4 = c \qquad 3 = c \qquad 12 = 4c$

↑ ↑ contradiction

No such scalar c exists.

Not parallel.