WeBWorK assignment number HW1 is due : 02/13/2008 at 11:59pm CST.

The primary purpose of WeBWorK is to let you know that you are getting the correct answer or to alert you if you are making some kind of mistake. Usually you can attempt a problem as many times as you want before the due date. However, if you are having trouble figuring out your error, you should consult the book, or ask a fellow student, one of the TA's or your professor for help. Don't spend a lot of time guessing – it's not very efficient or effective.

You can use the Feedback button on each problem page to send e-mail to the professors.

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1. (1 pt) Find the unit vector with the same direction as $\langle 2,2,5\rangle$.

Unit Vector = ⟨ _____ , _____ , _____ ⟩

Also, find a vector of length five oriented in the opposite direction.

Vector = ⟨ _____ , _____ , _____ ⟩

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2. (1 pt) Find the angle between $\langle 0,4,0\rangle$ and $\langle 0,-3,-2\rangle$.

Angle = __________

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3. (1 pt) Find the scalar projection of $\mathbf{u} = 3\mathbf{i} - 3\mathbf{j} + 4\mathbf{k}$ on $\mathbf{v} = 4\mathbf{i} + 1\mathbf{j} + 4\mathbf{k}$.

Scalar projection = ________

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4. (1 pt) If $\mathbf{u} = \langle -5,5,-1\rangle$ and $\mathbf{v} = \langle -3,2,1\rangle$, express $\mathbf{u}$ as the sum of a vector $\mathbf{m}$ parallel to $\mathbf{v}$ and a vector $\mathbf{n}$ perpendicular to $\mathbf{v}$.

$\mathbf{m} =$ ⟨ _____ , _____ , _____ ⟩

$\mathbf{n} =$ ⟨ _____ , _____ , _____ ⟩

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5. (1 pt) Find two perpendicular vectors $\mathbf{u}$ and $\mathbf{v}$ such that each is perpendicular to $\mathbf{w} = \langle -1,-3,4\rangle$.

As your answer, enter the vector $\mathbf{w}$.

$\mathbf{w}$ = ⟨ ___ , ___ , ___ ⟩

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6. (1 pt) Which of the following do ¡i¿ not ¡/i¿ make sense?

(a) $\mathbf{u}\cdot(\mathbf{v}\cdot\mathbf{w})$
(b) $(\mathbf{u}\cdot\mathbf{w})+\mathbf{w}$
(c) $|\mathbf{u}|\,(\mathbf{v}\cdot\mathbf{w})$
(d) $(\mathbf{u}\cdot\mathbf{v})\mathbf{w}$
(e) $(|\mathbf{u}|\,\mathbf{v})\cdot\mathbf{w}$
(f) $|\mathbf{u}|\cdot\mathbf{v}$

List the letters of those that do not make sense with a space (no commas) between them. _____

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7. (1 pt) Find the angle between a main diagonal of a cube and one of its faces.

Angle = ________

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8. (1 pt) Find the symmetric equations of the line of intersection of the following two planes:

$$4x+3y-7z=8$$

and

$$10x+6y-5z=-1.$$

$(x-$ _____ $)/$ _____ $= (y-$ _____ $)/$ _____ $= z/12$

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9. (1 pt) Find the parametric equations of the line through $(9,-8,11)$ that intersects the z-axis at right angles.

$x = t$

$y =$ _____ $+$ _____ t

$z =$ _____ $+$ _____ t

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10. (1 pt) Find the equation of the plane that contains the parallel lines

$$x=-2+2t, \quad y=1+4t, \quad z=2-t$$

and

$$x=8-2t, \quad y=-1-4t, \quad z=1+t.$$

_____ $x+$ _____ $y+$ _____ $z=1$

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11. (1 pt) Find the unit tangent vector $\mathbf{T}(t)$ and the curvature $\kappa(t)$ at the point where $t=1/2$ if $\mathbf{U}(t)=5t^2\mathbf{i}+1t\mathbf{j}$.

$\mathbf{T}(\frac{1}{2}) =$ ⟨ _____, _____ ⟩

$\kappa(\frac{1}{2})$ = _____

12. (1 pt) Find the unit tangent vector $\mathbf{T}(t)$ and the curvature $\kappa(t)$ at the point where $t = t_1$ if

$$\mathbf{r}(t) = e^t \cos(t)\mathbf{i} + e^t \sin(t)\mathbf{j}$$

and $t_1 = -2\pi$.

$\mathbf{T}(t_1) = (\ \_\_\_\_\_\_,\ \_\_\_\_\_\_\ )$

$\kappa(t_1) = \_\_\_\_\_\_$

13. (1 pt) Find the curvature and the radius of the curvature at the point $(1,0)$ of the curve $y = 1\ln(x)$.

curvature = ______
radius of curvature = ______

14. (1 pt) Find the tangential and normal components (a_T and a_N) of the acceleration vector at $t = -4$ if

$$\mathbf{r}(t) = (2t+1)\mathbf{i} + (t^2 - 2)\mathbf{j}$$

$a_T = \_\_\_\_\_\_$

$a_N = \_\_\_\_\_\_$

15. (1 pt) Consider the path for a particle given by

$$\mathbf{r}(t) = \sin(t)\mathbf{i} + \sin(2t)\mathbf{j}$$

for $0 \le t \le 2\pi$.

When is the acceleration zero? Enter your answers in the blanks below in increasing order.

At $t =$ _____ , _____ , _____

When does the acceleration vector point to the origin? Enter your answers in the blanks below in increasing order.

At $t =$ _____ , _____