WebAssign
Hw 1 (12.1-12.4): Vectors and Geometry of Space (Homework)

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MA 261 Fall 2012, section 121, Fall 2012
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Current Score : 20 / 20 **Due :** Thursday, August 23 2012 11:00 PM EDT

1. 1.25/1.25 points | Previous Answers SCalcET7 12.1.012.

Find an equation of the sphere with center $(4, -7, 3)$ and radius 5.

Use an equation to describe its intersection with each of the coordinate planes. (If the sphere does not intersect with the plane, enter DNE.)

intersection with *xy*-plane

intersection with *xz*-plane

intersection with *yz*-plane

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2. 1.25/1.25 points | Previous Answers SCalcET7 12.1.017.

Write the equation of the sphere in standard form.

$$2x^2 + 2y^2 + 2z^2 = 12x - 20z + 1$$

Find its center and radius.

center $(x, y, z) = ($ $)$

radius

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3. 1.25/1.25 points | Previous Answers SCalcET7 12.1.035.

Write an inequality to describe the region.

The region between the yz-plane and the vertical plane $x = 6$

- $0 < x^2 + y^2 + z^2 < 6$
- $0 < x < 6$ ✓
- $0 < z < 6$
- $0 < y < 6$
- none of these

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4. 1.25/1.25 points | Previous Answers SCalcET7 12.1.036.

Write an inequality to describe the region.

The solid cylinder that lies on or below the plane $z = 7$ and on or above the disk in the xy-plane with center the origin and radius 5

- $x^2 + y^2 \le 5,\ 0 \le z \le 7$
- $x^2 + y^2 \le 25,\ 0 \le z \le 7$ ✓
- $x^2 + y^2 + z^2 \le 7,\ 0 \le z \le 5$
- $x^2 + y^2 + z^2 \le 25,\ 0 \le z \le 7$
- none of these

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5. 1.25/1.25 points | Previous Answers SCalcET7 12.2.019.

Find $\mathbf{a} + \mathbf{b}$, $2\mathbf{a} + 3\mathbf{b}$, $|\mathbf{a}|$, and $|\mathbf{a} - \mathbf{b}|$.

$\mathbf{a} = \langle 3, -4 \rangle$, $\mathbf{b} = \langle -5, 2 \rangle$

$\mathbf{a} + \mathbf{b}$ =

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$2\mathbf{a} + 3\mathbf{b}$ =

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$|\mathbf{a}|$ =

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$|\mathbf{a} - \mathbf{b}|$ =

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6. 1.25/1.25 points | Previous Answers SCalcET7 12.2.024.

Find a unit vector that has the same direction as the given vector.

$\langle -8, 4, 8 \rangle$

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7. 1.25/1.25 points | Previous Answers SCalcET7 12.2.026.

Find a vector that has the same direction as $\langle -2, 4, 2 \rangle$ but has length 6.

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8. 1.25/1.25 points | Previous Answers SCalcET7 12.3.020.

Find the angle between the vectors. (First find an exact expression and then approximate to the nearest degree.)

$\mathbf{a} = \mathbf{i} + 2\mathbf{j} - 2\mathbf{k}, \quad \mathbf{b} = 8\mathbf{i} - 6\mathbf{k}$

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exact

approximate 48.19 °

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9. 1.25/1.25 points | Previous Answers SCalcET7 12.3.023.

Determine whether the given vectors are orthogonal, parallel, or neither.

(a) $\mathbf{a} = \langle -6, 3, 6 \rangle$, $\mathbf{b} = \langle 6, -6, 1 \rangle$

- ○ orthogonal
- ○ parallel
- ◉ neither

✓

(b) $\mathbf{a} = \langle 6, 6 \rangle$, $\mathbf{b} = \langle -3, 3 \rangle$

- ◉ orthogonal
- ○ parallel
- ○ neither

✓

(c) $\mathbf{a} = -\mathbf{i} + 2\mathbf{j} + 2\mathbf{k}$, $\mathbf{b} = 4\mathbf{i} + 3\mathbf{j} - \mathbf{k}$

- ◉ orthogonal
- ○ parallel
- ○ neither

✓

(d) $\mathbf{a} = 4\mathbf{i} + 2\mathbf{j} - 2\mathbf{k}$, $\mathbf{b} = -6\mathbf{i} - 3\mathbf{j} + 3\mathbf{k}$

- ○ orthogonal
- ◉ parallel
- ○ neither

✓

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10. 1.25/1.25 points | Previous Answers SCalcET7 12.3.025.

Use vectors to decide whether the triangle with vertices $P(-1, -1, -3)$, $Q(0, 2, -5)$, and $R(4, 0, -6)$ is right-angled.

- (•) Yes, it is right-angled.
- ( ) No, it is not right-angled.

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11. 1.25/1.25 points | Previous Answers SCalcET7 12.3.028.

Find two unit vectors that make an angle of 60° with $\mathbf{v} = \langle 4, 3 \rangle$. (Enter your answer as a comma-separated list of vectors. Round your answers to four decimal places.)

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12. 1.25/1.25 points | Previous Answers SCalcET7 12.4.003.

Find the cross product $\mathbf{a} \times \mathbf{b}$.

$\mathbf{a} = \mathbf{i} + 4\mathbf{j} - 2\mathbf{k}, \quad \mathbf{b} = -\mathbf{i} + 4\mathbf{k}$

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Verify that it is orthogonal to both $\mathbf{a}$ and $\mathbf{b}$.

$(\mathbf{a} \times \mathbf{b}) \cdot \mathbf{a} =$ 0

$(\mathbf{a} \times \mathbf{b}) \cdot \mathbf{b} =$ 0

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13. 1.25/1.25 points | Previous Answers SCalcET7 12.4.019.

Find two unit vectors orthogonal to both $\langle 7, 5, 1 \rangle$ and $\langle -1, 1, 0 \rangle$.

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(smaller **i**-value)

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(larger **i**-value)

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14. 1.25/1.25 points | Previous Answers SCalcET7 12.4.027.

Find the area of the parallelogram with vertices $A(-4, 4)$, $B(-2, 7)$, $C(2, 5)$, and $D(0, 2)$.

16

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15. 1.25/1.25 points | Previous Answers SCalcET7 12.4.032.

Consider the points below.

$P(-1, 4, 1)$, $Q(0, 6, 3)$, $R(5, 3, -1)$

(a) Find a nonzero vector orthogonal to the plane through the points P, Q, and R.

(b) Find the area of the triangle PQR.

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16. 1.25/1.25 points | Previous Answers SCalcET7 12.4.033.

Find the volume of the parallelepiped determined by the vectors **a**, **b**, and **c**.

$\mathbf{a} = \langle 1, 4, 2 \rangle, \quad \mathbf{b} = \langle -1, 1, 2 \rangle, \quad \mathbf{c} = \langle 4, 1, 5 \rangle$

45 ✔ cubic units

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