

Name _____ Date _____

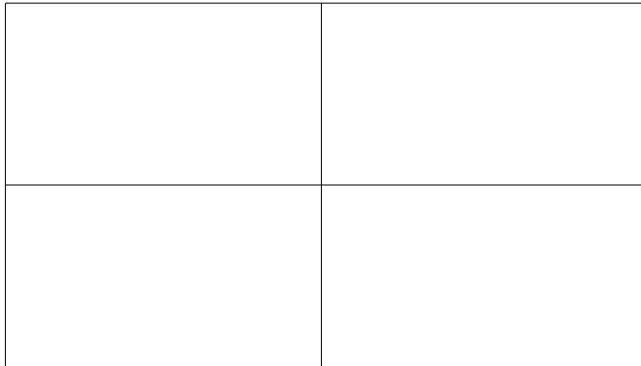
Instructions: Please show all of your work as partial credit will be given where appropriate, **and** there may be no credit given for problems where there is no work shown. All answers should be completely simplified, unless otherwise stated.

1. For $x=2\sqrt{t-2}$ and $y=3\sqrt{4-t}$ such that $2\leq t\leq 4$, do the following:

(a) (10 pts) Eliminate the parameter to obtain the corresponding Cartesian equation.

Answer 1(a): _____

(b) (10 pts) Graph the curve.



(c) (5 pts) Indicate if the curve is simple and/or closed.

Simple: T or F (circle one)

Closed: T or F (circle one)

2. (10 pts) Find the length of the curve given by $x=4\sqrt{t}$ and $y=t^2+\frac{1}{2t}$ for $\frac{1}{4}\leq t\leq 1$.

3. (15 pts) For position vector given by $\mathbf{r}(t)=\sin 2t\mathbf{i}+\cos 3t\mathbf{j}+\cos 4t\mathbf{k}$, find the velocity and acceleration vectors and the speed at $t=\frac{\pi}{4}$.

$\mathbf{v}(t) =$ _____

$\mathbf{a}(t) =$ _____

speed at $t=\frac{\pi}{4} =$ _____

4. (10 pts) Find the limit, if it exists. $\lim_{t \rightarrow 0^+} [\ln(t^3)\mathbf{i} + t^2 \ln(t)\mathbf{j} + t\mathbf{k}]$

Answer (4) : _____

5. (10 pts) Find the equation of the sphere that has the line segment joining (3, 1, 7) and (7, 5, 5) as a diameter.

Radius = _____

center = _____

Eqn of sphere: _____

6. (10 pts each) Let $\mathbf{a}=\langle 4,1,2\rangle$, $\mathbf{b}=\langle 2,4,1\rangle$ and $\mathbf{c}=6\mathbf{i}+3\mathbf{j}$. Find each of the following.

(a) $2\mathbf{a}-3\mathbf{c}$

(b) $\mathbf{a}\cdot(\mathbf{b}+\mathbf{c})$

$$2\mathbf{a}-3\mathbf{c} = \underline{\hspace{10cm}}$$

(c) $\mathbf{b}\cdot\mathbf{c}-|\mathbf{b}|$

$$\mathbf{a}\cdot(\mathbf{b}+\mathbf{c}) = \underline{\hspace{10cm}}$$

$$\mathbf{b}\cdot\mathbf{c}-|\mathbf{b}| = \underline{\hspace{10cm}}$$

(Note: This is # 6 continued $\mathbf{a}=\langle 4,1,2\rangle$, $\mathbf{b}=\langle 2,4,1\rangle$ and $\mathbf{c}=6\mathbf{i}+3\mathbf{j}$
(d) $\hat{\mathbf{c}}$ (the unit vector)

$$\hat{\mathbf{c}} = \underline{\hspace{10cm}}$$

(e) $\mathbf{a}\times(\mathbf{b}\times\mathbf{c})$

(f) $\mathbf{a}\cdot(\mathbf{b}\times\mathbf{c})$ $\mathbf{a}\times(\mathbf{b}\times\mathbf{c}) = \underline{\hspace{10cm}}$

$$\mathbf{a}\cdot(\mathbf{b}\times\mathbf{c}) = \underline{\hspace{10cm}}$$

7. (10 pts each) For $\mathbf{a}=3\mathbf{i}+4\mathbf{j}+5\mathbf{k}$ and $\mathbf{b}=2\mathbf{i}+\mathbf{j}+3\mathbf{k}$, find each of the following:

(a) Direction cosines for \mathbf{a} .

$$\cos \alpha = \underline{\hspace{4cm}}$$

$$\cos \beta = \underline{\hspace{4cm}}$$

$$\cos \gamma = \underline{\hspace{4cm}}$$

(b) The angle θ between \mathbf{a} and \mathbf{b} . (Just write a simplified expression. If you don't have a calculator just write the numerical formula for the angle.)

(c) Find the projection of \mathbf{b} onto \mathbf{a} . $\theta = \underline{\hspace{4cm}}$

Projection of \mathbf{b} onto $\mathbf{a} = \underline{\hspace{4cm}}$

8. (10 pts each) For the planes given by

$$3x - 2y + 5z = 16$$

and

$$4x + 2y + z = 13,$$

answer the following questions.

(a) Find the line of intersection between the planes and write that line in parametric equations.

Line: _____

(b) Find the equation of the plane that is perpendicular to the line of intersection and goes through the point (1, 3, 2).

Equation of plane: _____

9. (a) (10 pts) Convert $x^2+y^2=2y+2x$ from a Cartesian coordinate equation into an equation in cylindrical coordinates.

Answer : _____
(b) (10 pts) Convert $r=2\sin\theta$ from a cylindrical coordinate equation into an equation in Cartesian coordinates.

Answer : _____