

Full credit will be given only where all reasoning and work is provided. Where appropriate please enclose your final answers in boxes.

1. Convert the following rectangular coordinates into polar coordinates.

(a) $(-3, 0)$

(b) $(-2\sqrt{3}, 2)$

2. Convert the following polar coordinates into rectangular coordinates.

(a) $(3, 5\pi/4)$

(b) $(4, 3\pi)$

3. What is the radius and center of the circle $r = -8 \sin \theta$?

4. Convert $r \cos \theta = 4$ to rectangular coordinates.

5. Convert $2xy = x^2 + y^2$ to polar coordinates.

6. Find the parametric equations for the following lines:

(a) The line $y = 8x + 2$ from $x = 1$ to $x = 4$.

(b) The line from the point $(-1, 3)$ to $(1, 7)$.

7. When do the lines $x = 2t$, $y = 1 + 2t$ and $x = 4 - 5s$, $y = -9 + 2s$ intersect?

8. Find the parametric equations for the following curves:

(a) $y = 1 - x^2$ for positive y

(b) $x^2 + y^2 = 14$ with particle moving clockwise from $(-\sqrt{14}, 0)$ to $(\sqrt{14}, 0)$

9. For the parametric curve given by $x(t) = t^4 - \cos(t)$ and $y(t) = e^{2t} - t$ determine $\frac{dy}{dx}$, $\frac{d^2y}{dx^2}$

10. Sketch the curve of the following parametric equations:

(a) $x = \sin t, y = t, t \in R$

(b) $x = 5t - 3, y = 7t - 2$ where $0 \leq t \leq 1$

(c) $x = \sin(2t), y = \cos(2t)$ where $0 \leq t \leq \pi/2$

11. Let $\mathbf{a} = \langle -3, 0, 4 \rangle$ and $\mathbf{b} = \langle -1, 2, 3 \rangle$

(a) Calculate $-3\mathbf{a} + 4\mathbf{b}$.

(b) Find a vector of length .6 in the opposite direction of $\mathbf{a}$.

(c) Find a unit vector in the direction of $\mathbf{b}$.

(d) Determine $\text{proj}_{\mathbf{b}}(\mathbf{a})$ and $\text{proj}_{\mathbf{a}}(\mathbf{b})$