

CALCULUS BC
WORKSHEET 1 ON POLAR

Work the following on notebook paper.
Convert the following equations to polar form.

1. $y = 4$

2. $3x - 5y + 2 = 0$

3. $x^2 + y^2 = 25$

Convert the following equations to rectangular form.

4. $r = 3 \sec \theta$

5. $r = 2 \sin \theta$

6. $\theta = \frac{5\pi}{6}$

For the following, find $\frac{dy}{dx}$ for the given value of θ .

7. $r = 2 + 3 \sin \theta$, $\theta = \frac{3\pi}{2}$

9. $r = 4 \sin \theta$, $\theta = \frac{\pi}{3}$

8. $r = 3(1 - \cos \theta)$, $\theta = \frac{\pi}{2}$

10. $r = 2 \sin(3\theta)$, $\theta = \frac{\pi}{4}$

11. Find the points of horizontal and vertical tangency for $r = 1 + \sin \theta$. Give your answers in polar form, (r, θ) .

Use your calculator on problem 12.

12. Given the polar curve $r = \theta + \sin(2\theta)$ for $0 \leq \theta \leq \pi$

(a) Sketch the graph of the curve.

(b) Find the angle θ that corresponds to the point(s) on the curve where $x = -2$.

(c) Find the angle θ that corresponds to the point(s) on the curve where $y = 1$.

(d) For what values of θ , is $\frac{dr}{d\theta}$ positive? What does this say about r ?

What does it say about the curve?

Answers to Worksheet 1 on Polar

1. $r = 4 \csc \theta$

2. $r = \frac{-2}{3 \cos \theta - 5 \sin \theta}$

3. $r = 5$

4. $x = 3$

5. $x^2 + y^2 = 2y$

6. $y = -\frac{\sqrt{3}}{3}x$

7. 0

8. -1

9. $-\sqrt{3}$

10. $\frac{1}{2}$

11. Horiz: $\left(2, \frac{\pi}{2}\right), \left(\frac{1}{2}, \frac{7\pi}{6}\right), \left(\frac{1}{2}, \frac{11\pi}{6}\right)$

Vert.: $\left(\frac{3}{2}, \frac{\pi}{6}\right), \left(\frac{3}{2}, \frac{5\pi}{6}\right)$

12. (b) 2.786

(c) 0.661 and 2.223

(d) $0 \leq \theta < \frac{\pi}{3}$ and $\frac{2\pi}{3} < \theta \leq \pi$.

r is increasing. The curve is getting farther from the origin.

Answers to Worksheet 2 on Polar

1. $\frac{\pi}{3}$

3. 6π

5. 4

7. $\pi + 3\sqrt{3}$

2. 2π

4. $\frac{9\pi}{2}$

6. $\pi - \frac{3\sqrt{3}}{2}$

Answers to Worksheet 3 on Polar

1. $3\sqrt{3}$

3. π

5. $\frac{16\pi}{3} - 4\sqrt{3}$

2. $\frac{8\pi}{3} - 2\sqrt{3}$

4. $\frac{5\pi}{4}$

Answers to Worksheet 4 on Polar

1. $\frac{2}{3}$

6. 1 petal of $r = \sin 3\theta$

9. $4\pi^3$

2. $y - \frac{9}{4} = \frac{\sqrt{3}}{5} \left(x - \frac{3\sqrt{3}}{4} \right)$

7. (a) $r = 2 \sec \theta, r = 2$

10. (a) graph

3. $\frac{1}{2} \int_0^\pi \theta^2 d\theta$

(b) $\frac{1}{2} \int_{-\pi/3}^{\pi/3} (2^2 - \sec^2 \theta) d\theta$ (b) 1.839, 4.295

4. $\frac{1}{2} \int_{\pi/2}^\pi (1 + \sin \theta)^2 d\theta$

(c) $\frac{4\pi - 3\sqrt{3}}{3}$ (c) 0.921, 2.563

5. $\frac{1}{2} \int_0^{\pi/4} (2 \sin 4\theta)^2 d\theta$

8. (a) graph

(b) $2\sqrt{3} - \frac{2\pi}{3}$