Polar Quiz Review #1 – 11 Calculator Inactive; #12 - 18 Calculator Active

Convert the following to equations to polar form. Solve for r.

1. $y = 4$	2. $3x - 5y + 2 = 0$	3. $x^2 + y^2 = 25$

Convert the following equations to rectangular form. Solve for y.

4. $r = 3sec\theta$	5. $r = 2sin\theta$	6. $\theta = \frac{5\pi}{6}$

For the following, find dy/dx for the given value of θ.

7. $r = 2 + 3sin\theta; \theta = \frac{3\pi}{2}$	8. $r = 3(1 - cos\theta); \theta = \frac{\pi}{2}$	9. $r = 4sin\theta; \theta = \frac{\pi}{3}$
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)	

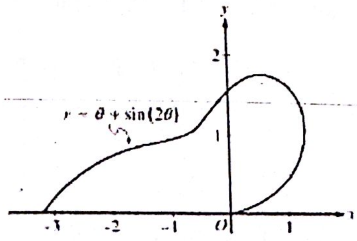
12. Given the polar curve $r = \theta + cos2\theta$ for $0 \leq \theta \leq \pi$.

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 points(s) on the curve where y = 1	

Find the area of the following. Calculator Active

13. Inside $r = 4 + 2cos\theta$	14.	15. inside the circle $r = 2$ & outside the cardioid $r = 2(1 - sin\theta)$
16. shared by the circle $r = 2$ and the cardioid $r = 2(1 - cos\theta)$	17. inside one petal of the four petaled rose $r = cos2\theta$	18. shared by the circles $r = 2cos\theta$ and $r = 2sin\theta$

The curve above is drawn in the xy-plane and is described by the equation in polar coordinates $r = \theta + \sin(2\theta)$ for $0 \le \theta \le \pi$, where r is measured in meters and θ is measured in radians. The derivative of r with respect to θ is given by $\frac{dr}{d\theta} = 1 + 2\cos(2\theta)$.



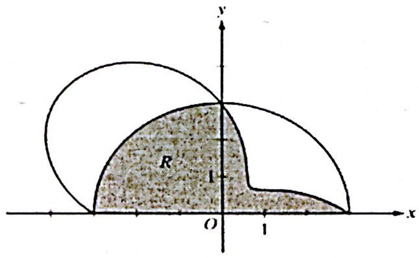
(a) Find the area bounded by the curve and the x-axis.

(b) Find the angle θ that corresponds to the point on the curve with x-coordinate -2.

(c) For $\frac{\pi}{3} < \theta < \frac{2\pi}{3}$, $\frac{dr}{d\theta}$ is negative. What does this fact say about r? What does this fact say about the curve?

(d) Find the value of θ in the interval $0 \le \theta \le \frac{\pi}{2}$ that corresponds to the point on the curve in the first quadrant with greatest distance from the origin. Justify your answer.

The graphs of the polar curves $r = 3$ and $r = 3 - 2\sin(2\theta)$ are shown in the figure above for $0 \le \theta \le \pi$.



(a) Let R be the shaded region that is inside the graph of $r = 3$ and inside the graph of $r = 3 - 2\sin(2\theta)$. Find the area of R.

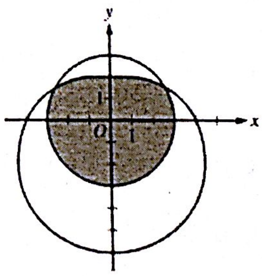
(b) For the curve $r = 3 - 2\sin(2\theta)$, find the value of $\frac{dx}{d\theta}$ at $\theta = \frac{\pi}{6}$.

(c) The distance between the two curves changes for $0 < \theta < \frac{\pi}{2}$.

Find the rate at which the distance between the two curves is changing with respect to θ when $\theta = \frac{\pi}{3}$.

(d) A particle is moving along the curve $r = 3 - 2\sin(2\theta)$ so that $\frac{d\theta}{dt} = 3$ for all times $t \ge 0$. Find the value of $\frac{dr}{dt}$ at $\theta = \frac{\pi}{6}$.

The graphs of the polar curves $r = 3$ and $r = 4 - 2\sin\theta$ are shown in the figure above. The curves intersect when $\theta = \frac{\pi}{6}$ and $\theta = \frac{5\pi}{6}$.



(a) Let S be the shaded region that is inside the graph of $r = 3$ and also inside the graph of $r = 4 - 2\sin\theta$. Find the area of S.

(b) A particle moves along the polar curve $r = 4 - 2\sin\theta$ so that at time t seconds, $\theta = t^2$. Find the time t in the interval $1 \le t \le 2$ for which the x-coordinate of the particle's position is -1.

(c) For the particle described in part (b), find the position vector in terms of t. Find the velocity vector at time $t = 1.5$.