1.(1 pt) A curve in polar coordinates is given by: $r = 10 + 3\cos\theta$.
Point P is at $\theta = \frac{23\pi}{20}$.
(1) Find polar coordinate r for P, with $r > 0$ and $\pi < \theta < \frac{3\pi}{2}$.
$r =$ _____
(2) Find cartesian coordinates for point P.
$x =$ _____ , $y =$ _____
(3) How may times does the curve pass through the origin when $0 < \theta < 2\pi$?

2.(1 pt) A curve with polar equation

$$r = \frac{37}{8\sin\theta + 65\cos\theta}$$

represents a line. This line has a Cartesian equation of the form $y = mx + b$,where m and b are constants. Give the formula for y in terms of x. For example, if the line had equation $y = 2x + 3$ then the answer would be $2 * x + 3$.

3.(1 pt) A circle C has center at the origin and radius 9. Another circle K has a diameter with one end at the origin and the other end at the point $(0, 13)$. The circles C and K intersect in two points. Let P be the point of intersection of C and K which lies in the first quadrant. Let (r, θ) be the polar coordinates of P, chosen so that r is positive and $0 \le \theta \le 2$. Find r and θ.
$r =$ _____
$\theta =$ _____

4.(1 pt) Match each polar equation below to the best description. Possible answers are C,E,H,L,P,R,S,V,and Z.
DESCRIPTIONS
C. Circle centered at origin, E. Ellipse, H. Hyperbola, L. Line neither vertical nor horizontal, P. Parabola, R. Circle not centered at origin, S. Spiral, V. Vertical Line, Z. Horizontal Line
POLAR EQUATIONS
__ 1. $r = \frac{13}{5\sin\theta + 19\cos\theta}$
__ 2. $r = \frac{1}{19\cos\theta}$
__ 3. $r = 19\sin\theta$
__ 4. $r = -5$
__ 5. $r^2 = \frac{13}{\sin 2\theta}$ Hint: $\sin 2\theta = 2\sin\theta\cos\theta$

5.(1 pt) Match each polar equation below to the best description. Possible answers are C,E,F,H,L,P,and S.
DESCRIPTIONS
C. Circle, E. Ellipse, F. Figure eight, H. Hyperbola, L. Line, P. Parabola, S. Spiral
Hint: it may help to change back to rectangular coordinates.
POLAR EQUATIONS
__ 1. $r = \frac{1}{6+6\cos\theta}$
__ 2. $r = \frac{1}{6\sin\theta+19\cos\theta}$
__ 3. $r = 6\sin\theta + 19\cos\theta$
__ 4. $r = \frac{1}{6+19\cos\theta}$
__ 5. $r = \frac{1}{19+6\cos\theta}$

6.(1 pt) Match each polar equation below to the best description. Each answer should be C,F,I,L,M,O,or T.
DESCRIPTIONS
C. Cardioid, F. Rose with four petals, I. Inwardly spiraling spiral, L. Lemacon, M. Lemniscate, O. Outwardly spiraling spiral, T. Rose with three petals
POLAR EQUATIONS
__ 1. $r = 3\theta, r > 0$
__ 2. $r^2 = 6\cos 2\theta$
__ 3. $r = 3 - 3\sin\theta$
__ 4. $r = \frac{3}{\theta}, r > 0$
__ 5. $r = 12\sin 2\theta$
__ 6. $r = 3 + 6\cos\theta$
__ 7. $r = 3\cos 3\theta$

7.(1 pt) Match each polar equation below to the best description. Each answer should be C,E,F,H,L,O,P,R,S,T,or W.
DESCRIPTIONS
C. Cardioid, E. Ellipse, F. Lemniscate, H. Hyperbola, L. Line, O. Oval, P. Parabola, R. Rose with four petals, S. Spiral, T. Three-petaled rose,
POLAR EQUATIONS
__ 1. $1 = \tan\theta$
__ 2. $r = 7 - 7\sin\theta$
__ 3. $r = \theta, r > 0$
__ 4. $r^2 = \csc 2\theta$
__ 5. $r^2 = 19\sin 2\theta$
__ 6. $r = \sin 3\theta$
__ 7. $r = \sin 2\theta$

8.(1 pt) Match each polar equation below to the best description. Each answer should be C,F,I,L,M,O,or T.
DESCRIPTIONS
C. Cardioid, F. Rose with four petals, I. Inwardly spiraling spiral, L. Lemacon, M. Lemniscate, O. Outwardly spiraling spiral, T. Rose with three petals
POLAR EQUATIONS
__ 1. $r = 3\theta, r > 0$
__ 2. $r = 14\sin 2\theta$
__ 3. $r = 3 - 3\sin\theta$
__ 4. $r^2 = 6\cos 2\theta$
__ 5. $r = 3\cos 3\theta$
__ 6. $r = 14 + 14\cos\theta$