Precalculus

Name _____

Polar Practice

Date _____

Convert each pair of polar coordinates to rectangular coordinates.

1) $\left(4, \frac{\pi}{3}\right)$ $x = 4\cos\pi/3$ $4(\frac{1}{2})$, $4(\frac{\sqrt{3}}{2})$ $y = 4\sin\pi/3$ $(2, 2\sqrt{3})$

2) $(2, 100°)$ $x = 2\cos 100°$ $(-.35, 2)$ $y = 2\sin 100°$

3) $\left(2, \frac{\pi}{6}\right)$ $x = 2\cos\pi/6 = (\frac{2\sqrt{3}}{2}, 2(\frac{1}{2})$ $y = 2\sin\pi/6$ $(\sqrt{3}, 1)$

4) $\left(2, \frac{\pi}{5}\right)$ $x = 2\cos\pi/5$ $(1.6, 1.2)$ $y = 2\sin\pi/5$

Convert each pair of rectangular coordinates to polar coordinates where $r > 0$ and $0 \le \theta < 2\pi$.

5) $\left(\frac{3\sqrt{3}}{2}, -\frac{3}{2}\right)$ $r = \sqrt{(\frac{3\sqrt{3}}{2})^2 + (-\frac{3}{2})^2}$ $\theta = \tan^{-1}\left(\frac{-3/2}{3\sqrt{3}/2}\right)$ $(3, \frac{11\pi}{16})$

6) $(-\sqrt{2}, -\sqrt{2})$ $r = \sqrt{(-\sqrt{2})^2 + (-\sqrt{2})^2}$ $\theta = \tan^{-1}(-\sqrt{2}/-\sqrt{2})$ $(2\frac{5\pi}{14}$

7) $(-3, 1)$ $r = \sqrt{9+1}$ $(\sqrt{10}, -.3)$ $\theta = \tan^{-1}(-1/3)$ $(\sqrt{10}, 2.8)$

8) $(5, -4)$ $r = \sqrt{25+16}$ $(\sqrt{41}, -0.7$ $\theta = \tan^{-1}(-4/5)$ $(\sqrt{41}, +2.5)$

Find 3 other ways to write the same point.

9) $\left(1, \frac{\pi}{6}\right)$ $(1, -\frac{11\pi}{6})$ $(-1, 7\pi/6)$ $(-1, -5\pi/6)$

10) $(3, 80°)$ $(3, -280°)$ $(-3, 260°)$ $(-3, -100)$

Change the following equations to rectangular form.

11) $r = \frac{6}{1 + \sin\theta}$

$r + r\sin\theta = 6$

$r(1 + \sin\theta) = 6$

$\sqrt{x^2+y^2} + y = 6$

$\sqrt{x^2+y^2} = 6 - y$

$x^2 + y^2 = 36 - 12y + y^2$

Parabola

12) $r = \frac{6}{1 + 2\sin\theta}$

$r + 2r\sin\theta = 6$

$\sqrt{x^2+y^2} + 2y = 6$

$x^2 + y^2 = 36 - 24y + 4y^2$

$x^2 - 3y^2 + 24y = 36$

hyperbola

13) $r = \frac{1}{1+4\cos\theta}$

$x^2+y^2 = 1-8x+16x^2$

$-15x^2+y^2 = 1-8x$

hyperbola

$r+4r\cos\theta = 1$

$r^2+y^2+4x = 1$

14) $r = 2\cos\theta + 2\sin\theta$

$r^2 = 2r\cos\theta + 2r\sin\theta$

$x^2+y^2 = 2x+2y$

circle

15) $\tan\theta = 5$

$\frac{y}{x} = 5$ linear

$y = 5x$

16) $r = 4\cos\theta$

$r^2 = 4r\cos\theta$

$x^2+y^2 = 4x$ circle

Convert each equation from rectangular to polar form.

17) $(x+2)^2+(y-2)^2 = 8$ $r = -4\cos\theta + 4\sin\theta$

$x^2+4x+4+y^2-4y+4 = 8$

$r^2+4r\cos\theta-4r\sin\theta = 0$

18) $(x+1)^2+(y-1)^2 = 2$ $r = -2\cos\theta+2\sin\theta$

19) $x^2+(y+2)^2 = 4$

$x^2+y^2+4y+4 = 4$

$r^2+4r\sin\theta = 0$

$r(r+4\sin\theta) = 0$

$r = 0$ $(r = -4\sin\theta)$

20) $y = \frac{x|}{x}$

$\frac{y}{x} = 1$ $y-x = 0$

$\tan\theta = 1$ $r\sin\theta - r\cos\theta = 0$

$\theta = \pi/4$ $r(\sin\theta-\cos\theta) = 0$

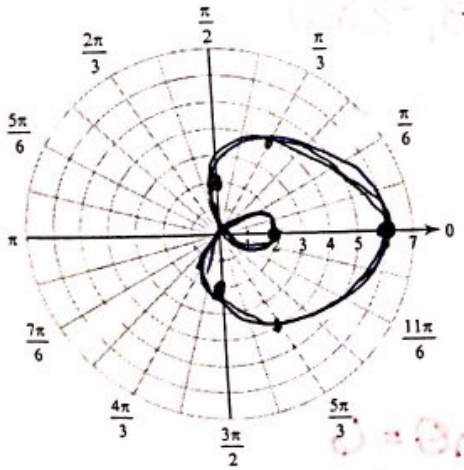
$r = 0$

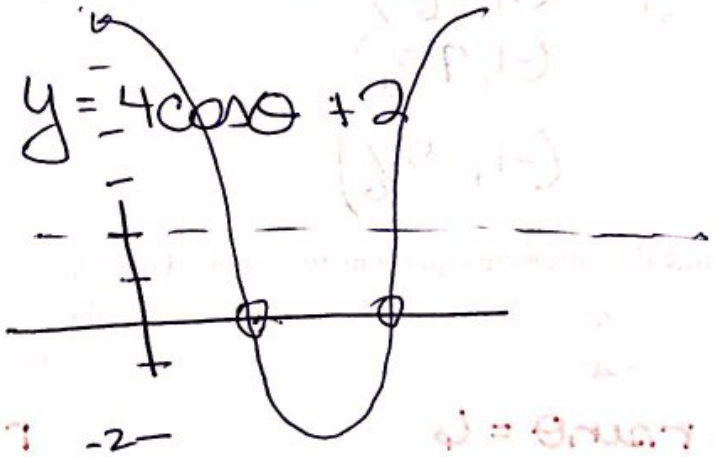
Consider each polar equation. Classify the curve; and sketch the graph.

a b

21) $r = 2+4\cos\theta$

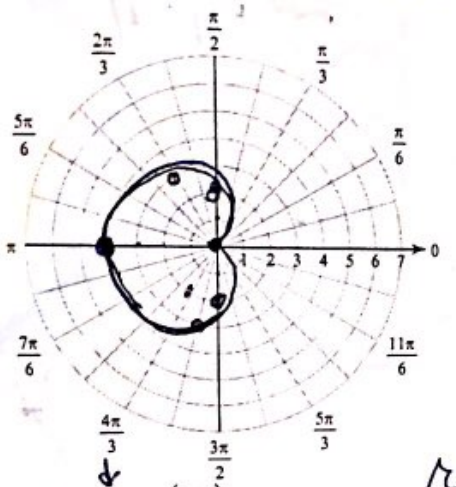
limacon w/ inner loop





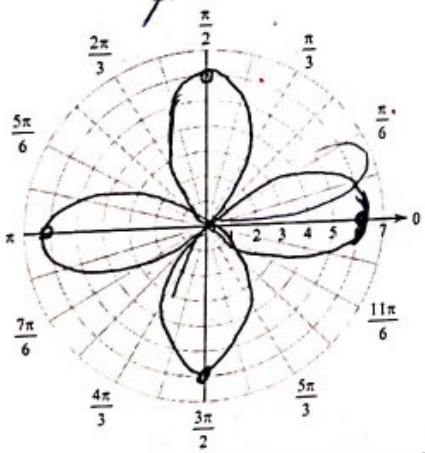
...each polar equation and covert to rectangular form:

22) $r = 2 - 2\cos\theta$ Cardiod



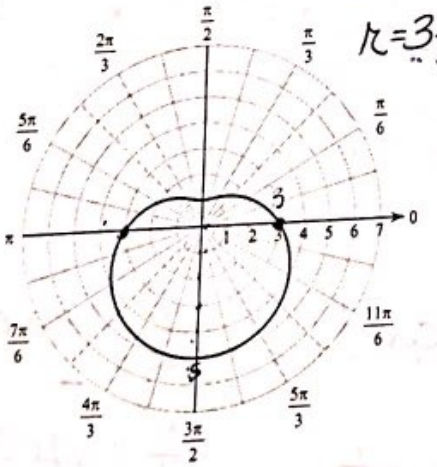
$r = 2 - 2\cos\theta$

23) $r = 6\cos(2\theta)$ rose 4pt.

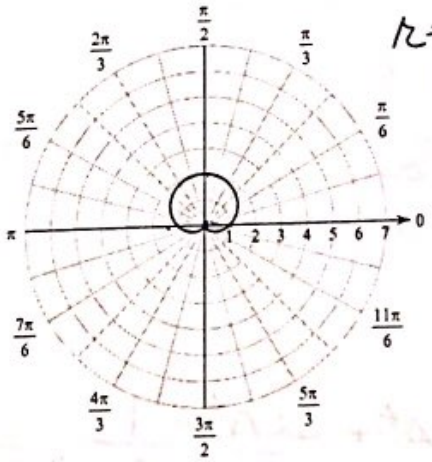


Consider each polar graph. Classify the curve; and write the equation.

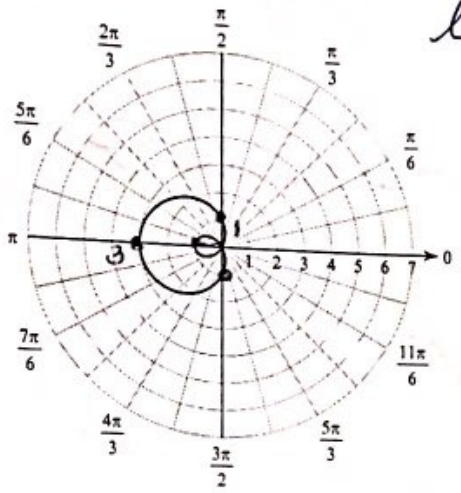
24) Limicon $r = 3 - 2\sin\theta$



25) Cestroid $r = 1 + \sin\theta$ $1 + 1\sin\theta$



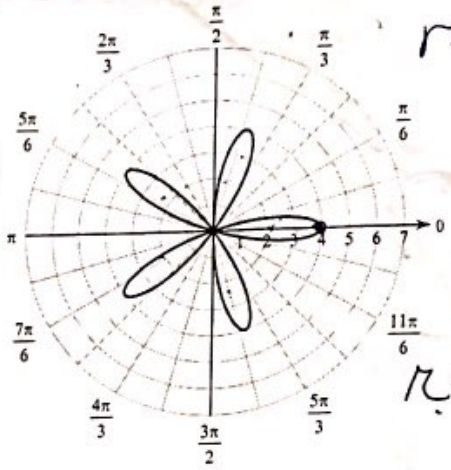
26)



limacon w/ loop

$r = 1 - 2\cos\theta$

27)



rose

$r = 4$

$r = 4\cos(5\theta)$

$4\cos(2\theta)$

Write each pair of parametric equations in rectangular form.

28) $x = 5\sin t,\ y = 2\cos t$

$\frac{x^2}{25} + \frac{y^2}{4} = 1$

29) $x = 3\sin t,\ y = 3\cos t$

$\frac{x^2}{9} + \frac{y^2}{9} = 1$

30) $x = t + 4,\ y = \frac{t}{2}$

$t = x - 4$ $\quad y = \frac{x-4}{2}$

31) $x = t - 5,\ y = 2t^2 - 1$

$t = x + 5$ $\quad y = 2(x+5)^2 - 1$

$y = 2(x^2 + 10x + 25) - 1$

$y = 2x^2 + 20x + 49$

32) $x = t,\ y = -\frac{t^2}{6}$

$y = -\frac{x^2}{6}$

33) $x = 2\tan t,\ y = \sec t$

$y^2 - \frac{x^2}{4} = 1$

$\frac{x}{2} = \tan t$ $\quad \frac{x^2}{4} = \tan^2$

$\frac{y}{1} = \sec t$ $\quad \frac{y^2}{1} = \sec^2$

$\frac{\cos^2}{\cos^2} + \frac{\sin^2}{\cos^2} = \frac{1}{\cos^2}$

$1 + \tan^2 = \sec^2$

$\frac{x^2}{4} + \frac{y^2}{1} = \tan^2 + \sec^2$

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