Standard curves in polar coordinates

First, be aware that replacing θ everywhere by $\theta - \theta_0$ in any of these equations simply rotates the graph counterclockwise around the origin by θ_0. Thus, for example, since $r = 2\cos(\theta)$ is a circle passing through the origin with center on the x-axis, $r = 2\cos(\theta - \frac{3\pi}{4})$ is a circle going through the origin with center in the 2nd quadrant (on the line $y = -x$). Finally, replacing (r,θ) by $(-r,\theta+\pi)$ will change an equation where r is positive at a point to one where r is negative at that point, or vice versa. This is useful since r <u>must</u> be positive in our polar double integrals.

In the following table, a, b, and c are all constants with the indicated restrictions.

Equation	Shape
$r = c$, $c > 0$	Circle of radius c centered at the origin.
$\theta = c$	Ray (half-line) starting at the origin (full line if you allow $r < 0$).
$r = a\cos(\theta) + b\sin(\theta)$, a and b not both 0	Circle through the origin with center at $(\frac{a}{2},\frac{b}{2})$. In rectangular coordinates, this is $x^2 + y^2 = ax + by$.
$r = a\cos(n\theta)$ or $r = a\sin(n\theta)$, $a \neq 0$	If $n > 1$ is an odd integer, these are n - leaf clovers. If $n > 1$ is an even integer, these are $2n$ -leaf clovers.
$r = a + b\cos(\theta)$ or $r = a + b\sin(\theta)$, $ab \neq 0$	Cardioid - classic heart shape with the cusp at the origin if a and b have the same absolute value.
$r^2 = a\cos(2\theta)$ or $r^2 = a\sin(2\theta)$, $a \neq 0$	Lemniscate (shape of ∞) with center at origin. With the cosine and $a > 0$, runs horizontal, with cosine and $a < 0$, runs vertical. With the sine, runs diagonally along $y = x$ or $y = -x$ depending on the sign of a.
$r = a\theta + b$, $a \neq 0$	Spiral, if $a > 0$ goes outward as you move counterclockwise, if $a < 0$ goes outward as you move clockwise.