Name: _____ **Precalculus Unit 10, Lesson 12**

Aim: What are some interesting polar graphs?

I. Do Now:

(a) Convert each equation to rectangular form:.

(i) $\theta = 0$ (ii) $r = \dfrac{3}{\sin\theta - 2\cos\theta}$

(b) Convert each point to polar form

(i) $\left(\sqrt{3}, -1\right)$ (ii) $\left(-1, -1\right)$

II. Calculator Setup for Polar Graphs

MODE: Radian, Pol(ar)

WINDOW: $\theta\text{min} = 0,\ \theta\text{max} = 2\pi,\ \theta\text{step} = 0.138$ $X\text{min} = -6,\ X\text{max} = 6,\ Y\text{min} = -4,\ Y\text{max} = 4$

TABLE: Use TBLSET and TABLE to find points (r, θ)

III. Several important types of graphs have equations that are simpler in polar form than in rectangular form. For example, the circle $r = 4\sin\theta$ has the more complicated rectangular equation $x^2 + (y-2)^2 = 4$. Use your graphing calculator to graph equation and sketch it below.

1. $r = 3 + 2\cos\theta$	2. $r = 3 - 4\sin\theta$	Limaçons
3. $r = 4\sin 3\theta$	4. $r = 5\cos 2\theta$	Rose Curves (What determines the number of petals?)
5. $r^2 = 4\sin 2\theta$	6. $r^2 = 4\cos 2\theta$	Lemniscates
7. $r = 3\cos\theta$	8. $r = 2\sin\theta$	Circles

IV. Other interesting polar graphs to explore:

9. $r = \theta \quad (-2\pi \le \theta \le 2\pi)$ spiral of Archimedes
10. $r^2\theta = 1$ lituus
11. $r = e^{\theta}$ logarithmic spiral
12. $r = e^{\cos\theta} - 2\cos 4\theta + \sin^5\left(\frac{\theta}{12}\right)$ butterfly curve
13. $r = \cos\frac{\theta}{2}$

HW37
- p. 805: 15, 16, 22, 42, 51, 56
- p. 518: 2, 8a, 9ab