Classroom Examples for Pre-Calculus #19

*Discuss use of polar in the real world (a new perspective) and the structure of Polar Graph Paper
*Polar form (pure) is used for real rectangular form – $(1, \sqrt{3})$ becomes $(2, 60^\circ)$
*Polar form (trig) is used for imaginary rectangular form – 1+2i becomes $\sqrt{3}(\cos 60^\circ + i \sin 60^\circ)$
*The first # is the length of the hypotenuse in the right triangle formed followed by the angle
All graphs on this worksheet, except #6, are curves that go through the plotted points
*Discuss converting polar to rectangular and vice-versa
*Convert rectangular equations to polar and vice-versa: $x^2 + y^2 = r^2$ and $x = r\cos\theta \quad y = r\sin\theta$
*Tricks – Square both sides, multiply both sides by r, or x, or y, or rearrange the pieces…
*Graphing polar equations: plug in angels at 15 or 30 degree increments and then plot the curve and make sure all angles are in radians – it won't matter if you have all sines and cosines but it is crucial if theta is just there as a variable!

1) Graph the following points on a polar graph:

A) $(5, \frac{-7\pi}{6})$ B) $(4, 330^\circ)$ C) $(-3, \frac{11\pi}{12})$ D) $(0, 70^\circ)$ E) $(-6, \frac{-9\pi}{4})$

2) Find the polar coordinates of the point $(-7\sqrt{2}, 7\sqrt{2})$ twice, first in degrees and then again in radians, using the smallest possible positive angle.

3) Find the rectangular coordinates of the point $(-8, \frac{8\pi}{3})$.

4) Find the polar coordinates of the point $(\frac{11\sqrt{3}}{2}, \frac{-11}{2})$ twice, first in degrees and then again in radians, using the smallest possible positive angle.

5) Find the rectangular coordinates of the point $(-7, -2760^\circ)$.

6) Convert $x^2 + 3y^2 = 7$ to a polar equation.

7) Convert $r = 5$ to a rectangular equation.

8) Convert $x^2 = 6x - y^2$ to a polar equation.

9) Convert $\frac{r}{-5} = \sin\theta$ to a rectangular equation.

10) Convert $3y^2x = -24$ to a polar equation.

11) Convert $4r - \sin\theta = \cos\theta$ to a rectangular equation.

12) Graph the equation $r = 6\sin 2\theta$ for $0 \le \theta \le 2\pi$

13) Graph the equation $r = 3 + 3\cos\theta$ for $0 \le \theta \le 2\pi$

14) Graph the equation $r = \frac{\theta}{3}$ for $0 \le \theta \le 7\pi$

15) Graph the equation $r = 5 - 7\sin 4\theta$ for $0 \le \theta \le 2\pi$