PRECALC class opener Sec. 8.1 NAME _____ MOD ____

1. The polar coordinates of a point are given. Find the rectangular coordinates of each point.

$x = r\cos\theta$, $y = r\sin\theta$

a) $(5, 300°)$ $\left(\frac{5}{2}, \frac{-5\sqrt{3}}{2}\right)$

b) $(2, -\frac{3\pi}{4})$ $(-\sqrt{2}, -\sqrt{2})$

c) $(-3, 296°)$ $(-1.315, 2.696)$

a.) $x = 5\cos 300° = 5\cdot(1/2) = 5/2$

$y = 5\sin 300° = 5\cdot(-\sqrt{3}/2) = -5\sqrt{3}/2$

b.) $x = 2\cos(-3\pi/4) = 2\cdot\left(\frac{-\sqrt{2}}{2}\right) = -\sqrt{2}$

$y = 2\sin(-3\pi/4) = 2(-\sqrt{2}/2) = -\sqrt{2}$

c.) $x = -3\cos(296°) = -1.315$

$y = -3\sin(296°) = 2.696$

2) The rectangular coordinates of a point are given. Find polar coordinates for each point.

$x^2 + y^2 = r^2 \rightarrow r = \sqrt{x^2+y^2}$

Q3 a) $(-2, -2\sqrt{3})$ $\left(4, \frac{4\pi}{3}\right)$

Q1 c) $(8.3, 4.2)$ $(9.302, 26.841°)$

$r = \sqrt{(8.3)^2+(4.2)^2} = 9.302$

$\theta = \tan^{-1}\left(\frac{4.2}{8.3}\right) = 26.841°$

Q2 b) $(-5, 5)$ $\left(5\sqrt{2}, \frac{3\pi}{4}\right)$

$r = \sqrt{(-5)^2+(5)^2} = \sqrt{50} = 5\sqrt{2}$

$\theta = \tan^{-1}\left(\frac{5}{-5}\right) = \tan^{-1}(-1) = -\frac{\pi}{4}$, $-\frac{\pi}{2} < \theta < \frac{\pi}{2}$

a.) $r = \sqrt{(-2)^2+(-2\sqrt{3})^2} = 4$

$\tan\theta = \frac{y}{x} \rightarrow \theta = \tan^{-1}\left(\frac{-2\sqrt{3}}{-2}\right) = \tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$

* ADD π to the angle to obtain a coordinate in Q3 $\rightarrow \frac{\pi}{3} + \pi = \frac{4\pi}{3}$

* must stay in domain of $\tan^{-1}$ when solving

* ADD π to $-\frac{\pi}{4}$ to get into Q2

3) Transforming an Equation from Polar to Rectangular Form:

Write the equation $r^2 + 4r\sin\theta - 8r\cos\theta = 5$ as an equation in rectangular coordinates (x, y).

$x^2 + y^2 + 4y - 8x = 5$

$(x^2 - 8x + 16) + (y^2 + 4y + 4) = 5 + 16 + 4$

STANDARD Form of an equation of a circle $\rightarrow (x-4)^2 + (y+2)^2 = 25 \rightarrow (4, -2)$

• Circle w/ A center at $(4, -2)$ & A radius $= 5$

4) Transforming an Equation from Rectangular to Polar Form:

Write the equation $4x^2y = 1$ using polar coordinates (r, θ).

$4(r\cos\theta)^2(r\sin\theta) = 1$

$(4r^2\cos^2\theta)(r\sin\theta) = 1$

$\frac{4r^3\cos^2\theta\sin\theta}{4} = \frac{1}{4}$

$r^3\cos^2\theta\sin\theta = \frac{1}{4}$