Name_____ Math 12H Polar Coordinates/Equations

Polar Coordinates/Equations

(r, θ) $\qquad x = r\cos\theta$

r = directed distance from pole $\qquad y = r\sin\theta$

θ = direction angle $\qquad r^2 = x^2 + y^2$

$(r, \theta) = (r, \theta \pm 2n\pi)$ or $(-r, \theta \pm (2n+1)\pi)$ $\qquad \tan\theta = \frac{y}{x}$

(1) **Plot the following points:**

(a) $\left(3, \frac{\pi}{2}\right)$ (b) $\left(-2, \frac{11\pi}{6}\right)$ (c) $\left(-3, -\frac{7\pi}{4}\right)$

(2) **Give two sets of coordinates that are equivalent for each (r > 0, r < 0):**

(a) $\left(8, \frac{5\pi}{6}\right)$ (b) $(-2, \pi)$ (c) $\left(-1, -\frac{3\pi}{4}\right)$

(3) **Find the rectangular coordinates for each:**

(a) $\left(8, \frac{7\pi}{6}\right)$ (b) $\left(-6, \frac{3\pi}{2}\right)$ (c) $\left(-1, -\frac{5\pi}{3}\right)$

(4) **Convert the following to polar coordinates:**

(a) $(-4, 4)$ (b) $(0, -8)$ (c) $\left(-1, -\sqrt{3}\right)$ (d) $\left(-\sqrt{6}, -\sqrt{2}\right)$

(5) **Change each to a rectangular equation:**

(a) $r = 5$

(b) $\theta = \frac{5\pi}{4}$

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

(d) $r\sin^2\theta = 3\cos\theta$

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

(f) $r = \frac{2}{1+\cos\theta}$

(6) **Convert each to a polar equation:**

(a) $x^2 + y^2 = 49$

(b) $y = -4$

(c) $x^3 = 4y^2$

(d) $y = x$

(e) $x^2 + y^2 - 4x + 6y = 0$

(f) $x^2 - y^2 = 1$

(7) Convert each to a rectangular equation

(a) $x = 4t^2$, $y = 8t^3$

(b) $x = 2\cos t$, $y = 3\sin t$ $\quad 0 \le t^2 \le 2\pi$

(c) $x = \cos t$, $y = \cos 2t$

(d) $x = sin^2 t$, $y = sin^4 t$

(e) $x = \frac{3}{\sqrt{3-t}}$, $y = \frac{t-3}{t}$

(8) Find the parametric equation for the line with the given properties. Convert each to a rectangular equation.

(a) slope = ½ , passes through (4, -1)

(b) Passes through (6,7) and (7,8)

(9) What is the shape of the polar equation $r = 2 + 2\sin\theta$

10) What is the maximum value for r in the equation $r = 6(4 - 5\sin\theta)$