Precalculus Name_____

Converting Rectangular and Polar Form Notes

Date_____ Period____

Convert each equation from rectangular to polar form.

turn into only r's or θ's

1) $y = -x\sqrt{3}$

get rid of x, y

$\frac{y}{x} = -\sqrt{3}$

$\tan\theta = -\sqrt{3}$

$\theta = \frac{2\pi}{3}$

2) $y = 5x$

$\frac{y}{x} = 5$

$\tan\theta = 5$

or

$\theta = \tan^{-1}(5)$

3) $(x+3)^2 + (y-1)^2 = 10$

$x^2 + 6x + 9 + y^2 - 2y + 1 = 10$

$r^2 + 6r\cos\theta - 2r\sin\theta + 10 = 10$

$r^2 + 6r\cos\theta - 2r\sin\theta = 0$

4) $(x+2)^2 + y^2 = 4$

$x^2 + 4x + 4 + y^2 = 4$

$-4 \quad -4$

$r^2 + 4r\cos\theta = 0$

$* -r \rightarrow r + 4\cos\theta = 0$

$r = -4\cos\theta$

5) $x = \frac{y^2}{4}$

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

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

$4 = r\tan\theta\sin\theta$

$r = 4\cot\theta\csc\theta$

6) $y = \frac{x^2}{3}$

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

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

$3 = r\cot\theta\cos\theta$

$r = 3\tan\theta\sec\theta$

Convert each equation from polar to rectangular form.

7) $\theta = \frac{3\pi}{4}$

$\tan\theta = \tan\frac{3\pi}{4}$

$\frac{y}{x} = -1$

$y = -x$

8) $r = 4\cos\theta + 2\sin\theta$

$r \cdot r$

$r^2 = 4r\cos\theta + 2r\sin\theta$

$x^2 + y^2 = 4x + 2y$

$x^2 - 4x + y^2 - 2y = 0$

$(x-2)^2 + (y-1)^2 = 5$

9) $r = -6\cos\theta$

think about this graph

off to left w/ r = 3

c. $(-3, 0)$

$(x+3)^2 + y^2 = 9$

$r^2 = -6r\cos\theta$

$x^2 + y^2 = -6x$

$x^2 + 6x + y^2 = 0$

10) $r = 2\tan\theta\sec\theta$

$\tan\theta = \frac{\sin\theta}{\cos\theta}$ $\sec\theta = \frac{1}{\cos\theta}$

$r = \frac{2\sin\theta}{\cos\theta}\cdot\frac{1}{\cos\theta}$

$r\cos\theta \; r\cos\theta = 2\sin\theta$

$x \; x = 2y$

$x^2 = 2y$

$r = 2\tan\theta\sec\theta$

$r = 2\frac{y}{x}\sec\theta$

$r = 2\frac{y}{x}\cdot\frac{1}{\cos\theta}$

$r\cos\theta = \frac{2y}{x}$

$x = \frac{2y}{x}$

$x^2 = 2y$

11) $r^2 = 4\csc(2\theta)$

$r^2 = \frac{4}{\sin(2\theta)}$

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

$r^2 \; 2\sin\theta\cos\theta = 4$

$2r\sin\theta \; r\cos\theta = 4$

$2yx = 4$ → $xy = 2$

12) $r^2 = 3\sec(2\theta)$

$r^2 = \frac{3}{\cos(2\theta)}$

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

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

$r^2\cos^2\theta - r^2\sin^2\theta = 3$

$x^2 - y^2 = 3$