uation Conversion

We can use the Coordinate Conversion Equations to convert polar form to rectangular form and vice versa. For example, the polar equation $r = 4\cos\theta$ can be converted to rectangular form as follows:

Just as with parametric equations, the domain of a polar equation in r and θ is understood to be all values of θ for which the corresponding values of r are real numbers. You must also select a value for θmin and θmax to graph in polar mode.

Converting from Polar Form to Rectangular Form: Convert the polar equation to rectangular form ~~and identify the graph~~

Ex4) $r = 4\sec\theta$

$\frac{r}{1} = \frac{4}{\cos\theta}$

$r\cos\theta = 4$

$x = 4$

vertical line!

Ex5) $r = 4\cos\theta$

$r(r) = 4(r)\cos\theta$

r^2

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

ellipse

E6) $r = 3\cos\theta$

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

$x^2 + y^2 = 3x$

Ex7) $r^2 = -3\sec\theta$

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

$r = \frac{-3}{x}$

$\sqrt{x^2+y^2} = -\frac{3}{x}$

Ex8) $\left(\frac{r}{3\tan\theta}\right) = (\sin\theta)\, r$

r

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

$\frac{x^2+y^2}{3\cdot\frac{y}{x}} = \frac{y}{1}$

$x^2 + y^2 = \frac{3y^2}{x}$

$x^3 + xy^2 = 3y^2$

Converting from Rectangular Form to Polar Form: Convert from rectangular form to polar form.

Ex8) $x^2 + y^2 = 1$

$r^2 = 1$

$r = \pm 1$

Ex9) $y = 2x+1$

$r\sin\theta = 2r\cos\theta + 1$

$r\sin\theta - 2r\cos\theta = 1$

$r(\sin\theta - 2\cos\theta) = 1$

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

Ex10) $y = \frac{3}{x}$

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

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

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

$r = \pm\sqrt{\frac{3}{\sin\theta\cos\theta}}$

Ex11) $(x-3)^2 + (y-2)^2 = 13$

$x^2 - 6x + 9 + y^2 - 4y + 4 = 13$

$r^2 - 6r\cos\theta - 4r\sin\theta + 13 = 13$

$r^2 - 6r\cos\theta - 4r\sin\theta = 0$

$r(r - 6\cos\theta - 4\sin\theta) = 0$

$r = 0$ single point (at the pole)

$r - 6\cos\theta - 4\sin\theta = 0$

$r = 6\cos\theta + 4\sin\theta$