MAT 137 (Calculus II) Prof. Swift

Polar Coordinates

It is easy to convert from polar to rectangular coordinates: $x = r\cos(\theta)$ and $y = r\sin(\theta)$.

However, converting from rectangular to polar coordinates is tricky: $r^2 = x^2 + y^2$ and $\tan(\theta) = y/x$ (provided $x \neq 0$). If we are told we want $r \geq 0$, then choose $r = \sqrt{x^2 + y^2}$. However, note that $\theta = \arctan(y/x)$ *is only true in quadrant I.* To find θ, draw a picture of the point in the x-y plane! Consider what quadrant you are in.

Convert these points to polar coordinates. If possible, give the unique answer with $r \geq 0$ and $0 \leq \theta < 2\pi$. Do not use inverse trig functions in the final answer, if possible.

$(x, y) = (1, \sqrt{3})$ has polar coordinates $(r, \theta) =$

$(x, y) = (-1, \sqrt{3})$ has polar coordinates $(r, \theta) =$

$(x, y) = (-\sqrt{3}, -1)$ has polar coordinates $(r, \theta) =$

$(x, y) = (\frac{1}{2}, \frac{-\sqrt{3}}{2})$ has polar coordinates $(r, \theta) =$

$(x, y) = (-2, 0)$ has polar coordinates $(r, \theta) =$

$(x, y) = (-3, 4)$ has polar coordinates $(r, \theta) =$

$(x, y) = (0, -1)$ has polar coordinates $(r, \theta) =$

$(x, y) = (-2, -2)$ has polar coordinates $(r, \theta) =$

$(x, y) = (3, 0)$ has polar coordinates $(r, \theta) =$

$(x, y) = (0, 0)$ has polar coordinates $(r, \theta) =$

(This has many answers. Now you see why I said, "*If possible* give the unique answer ...".)

If you have extra time, work on the last webwork problem.