Quiz #1; Tuesday, date: 01/23/2018
MATH 53 Multivariable Calculus with Stankova
Section #117; time: 5 – 6:30 pm
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1. Identify the curve
$$r = 6\sec\theta$$
by finding a Cartesian equation for the curve.

Solution. Use the equations defining polar coordinates to convert the polar equation to a Cartesian equation. In this question it is possible to reach the solution by substituting the polar representation of r into either the x or y equation.

(Solution through x)
$$\begin{aligned} x &= r\cos\theta \\ x &= 6\sec\theta\cos\theta \\ x &= 6. \end{aligned}$$

(Solution through y)
$$\begin{aligned} y &= r\sin\theta \\ y &= 6\sec\theta\sin\theta \\ y &= \frac{6}{\cos\theta}\sin\theta \\ y &= 6\tan\theta \\ y &= 6\frac{y}{x} \\ x &= 4. \end{aligned}$$

The curve is a vertical line $x = 6$.

2. *True / False?* Given a curve in parametric form
$$x = f(t), \quad y = g(t), \quad -\infty < t < \infty.$$
This is always the same curve as
$$x = f(s^3), \quad y = g(s^3), \quad -\infty < s < \infty.$$

Solution. **True**; for any point $(f(t), g(t))$ on the first curve, it can be thought of as $(f(s^3), g(s^3))$ if we take $s = \sqrt[3]{s}$. On the other hand, for any point $(f(s^3), g(s^3))$ on the first curve, it can be thought of as $(f(t), g(t))$ if we take $t = s^3$.

3. *True / False?* All points can be described uniquely using polar coordinates (r, θ), once we require $r \geq 0$ and $0 \leq \theta < 2\pi$.

   Solution. **False**; the origin is always a bit weird, in that it cannot be uniquely described as $(0, \theta)$ for any θ is still the origin.

   Solution.