Name: **Solution**

MATH 231 ED5 / Spring 2010

Quiz 12

Instructions: You have $\lfloor e^2 \rfloor$ minutes to complete this quiz. No calculators, notes, phones, socializing, or other suspicious behaviors are allowed. Read the problems carefully. Explain your answers and show your work.

1. Find a Cartesian equation for the polar equation $r = \tan\theta \sec\theta$.

(a) We can proceed directly to polar via the identities $x^2 + y^2 = r^2$ and $\dfrac{y}{x} = \tan\theta$:

Notice that $\tan\theta = \dfrac{y}{x}$ implies $\sec\theta = \dfrac{r}{x}$ by a triangle argument. Then

$$r = \tan\theta\sec\theta \quad \Rightarrow \quad r^2 = r\tan\theta\sec\theta \quad \Rightarrow \quad r^2 = r\left(\frac{y}{x}\right)\left(\frac{r}{x}\right) \quad \Rightarrow \quad r^2 = r^2\frac{y}{x^2}$$
$$\Rightarrow \quad 1 = \frac{y}{x^2} \quad \Rightarrow \quad y = x^2.$$

(b) It is a bit easier (in my opinion) to convert to parametric first:

$x = r\cos\theta = \tan\theta\sec\theta\cos\theta = \tan\theta$ and

$y = r\sin\theta = \tan\theta\sec\theta\sin\theta = \tan^2\theta$, so

$y = x^2$.