Quiz 1; Wednesday, January 27
MATH 53 with Professor Stankova
Section 116; 3-4pm
GSI: Eric Hallman

Student name:

You have 10 minutes to complete the quiz. Calculators are not permitted, and remember to show your calculations and explain your reasoning in order to receive full credit.

1. Given the curve defined by the polar equation $r = 3$, find a Cartesian equation describing the tangent line at the point $\theta = \pi/3$.

   $x = r \cos \theta = 3 \cos \theta$ and $y = r \sin \theta = 3 \sin \theta$, so

   $$dy/dx = \frac{dy/dt}{dx/dt} = \frac{3 \cos \theta}{-3 \sin \theta} = -\frac{\cos \theta}{\sin \theta}.$$

   Therefore, when $\theta = \pi/3$, $dy/dx = -\frac{1/2}{\sqrt{3}/2} = -\sqrt{3}/3$.

   The tangent line passes through the point $(1/2, \sqrt{3}/2)$, so the equation for the line in point-slope form is $y - \sqrt{3}/2 = -\frac{\sqrt{3}}{3}(x - 1/2)$, or $y = -\frac{\sqrt{3}}{3}x + \frac{2\sqrt{3}}{3}$ in slope-intercept form.

ROUGH RUBRIC: 3 points for $x = r \cos \theta, y = r \sin \theta$.
3 points for $dy/dt = \frac{dy/dx}{dx/dt}$ or other formula to get the slope of the tangent line.
4 points for correctly getting the slope of the tangent line.
3 points for finding the point on the curve that the tangent line passes through.
2 points for correct slope-intercept form.