> **Read each question carefully and be sure to SHOW ALL WORK. Correct answer without proper justification will not receive a "Complete" grade. Paç fat! Good luck!**

Name: _____

Polar/Parametric and Conic Sections Challenge. I can use polar, parametric and conic sections creatively in new situations that require a deep understanding of them.

Criteria for Success: I can solve conceptual questions related to Polar and Parametric equations that lie on the top half of Bloom's Taxonomy (analyze, evaluate, and create).

Question: A space rocket is moving with coordinates $x(t) = -2\sin(t), y(t) = -1 + 2t$, where t is measured in hours and the coordinates in miles.

(a) Eliminate the parameter t to find the Cartesian equation in the form $x = f(y)$

(b) Compute the following quantities at $t = 1$:

    (i) $x(t) =$

    (ii) $y(t) =$

    (iii) $x'(t) =$

    (iv) $y'(t) =$

    (v) $\dfrac{dy}{dx} =$

    (vi) Speed $=$

(c) Interpret the meaning of the above rates of change related to the movement of the particle at $t = 1$, i.e., $x'(1), y'(1), \dfrac{dy}{dx}$, and speed.

(d) Suppose that at $t = 1$ hour, the space rocket runs out of fuel and no force is acting on it. Find the Cartesian equation of the path it's going to move about after $t = 1$ hour.

(e) Setup an integral calculating the length of the trip from $t = 0$ to $t = 1$ in terms of the parametric equation. You don't need to evaluate the integral. Check that you get the same answer if you used the Cartesian equation.