Due Date: May 4, 2016   Name: _____

Points: 10

Instructions: The following exercise is extra credit and is not a mandatory assignment. Show ALL your work and write neatly. This assignment is due at the beginning of the class period on the date above. Group work is allowed and encouraged, but each member must write up his/her own solutions. Submissions without staples, without a name, or without work shown *will not receive credit.* You may use a computer algebra system, if needed, and must indicate where in your solution it was used.

1. A machinist is building the part drawn below.
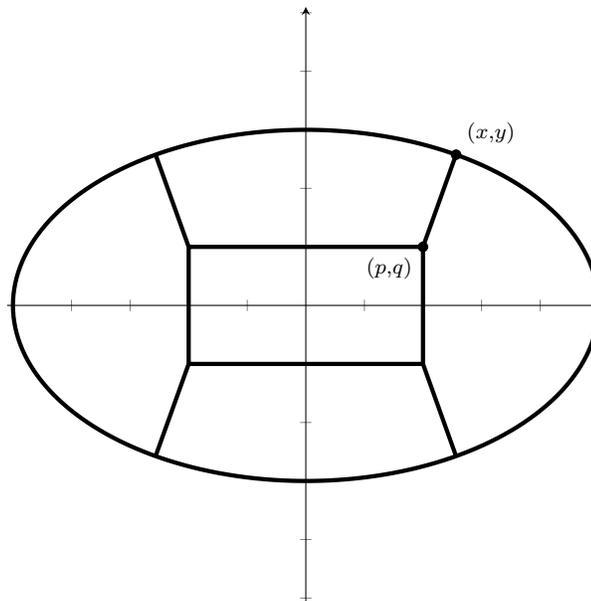
   The machinist only knows that the equation for the ellipse is given by $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ and the rectangle is centered on the origin.

   a. In the particular instance where $a = 5$, $b = 3$, $p = 2$ and $q = 1$, find the equation of the shortest normal line to the ellipse passing through (p, q). Round to two decimal places. *[You may use the following geometric fact: the shortest line between a point and a curve is normal to the curve.]*

   b. With a, b, p, q as in part (a), find the equations of the each of shortest normal lines to the ellipse passing through points $(-p, q)$, $(-p, -q)$, and $(p, -q)$. *[Hint: appeal to the symmetry of the object.]*