Assignment 4

The relationships used for studying rotated conics are listed below.

\[ x = x' \cos \phi - y' \sin \phi. \]
\[ y = x' \sin \phi + y' \cos \phi. \]
\[ \cot(2\phi) = \frac{A - C}{B}. \]

1. For each of the following conics
   
   (a) Determine the type of the conic,
   (b) Find the angle of rotation (\( \phi \)),
   (c) Find the unrotated version of the conic
   (d) Graph the unrotated conic, and
   (e) Graph the rotated conic.

   (a) \( 32x^2 - 72xy + 53y^2 = 80 \).
   (b) \( 7x^2 - 48xy - 7y^2 = 225 \).
   (c) \( 16x^2 - 24xy + 9y^2 - 60x - 80y + 100 = 0 \).

2. Consider the function \( y = x^4 - 5x^2 + 4 \).
   
   (a) Rotate the function by \( \pi/4 \) and by \( \pi/2 \) radians clockwise.
   (b) Find the equations of the rotated mappings.
      They are not functions. Why?
   (c) Graph the original and rotated functions and display all on the same axes.

3. Consider the function \( y = \sin x \).
   
   (a) Rotate the function by \( \pi/4 \) and by \( \pi/2 \) radians clockwise.
   (b) One of the rotations above can be written nicely by an appropriate choice of notation. Do so.