Math 140    Hw 8    Recommended problems, don't turn this in.

• Write the function in the form: \( y = a(x - h)^2 + k \).
  E.g., rewrite \( y = (x + 1)^2 \) as \( y = (x - (-1))^2 + 0 \).
• List the roots.
• Graph. On the graph mark the vertex and give both coordinates.
A. \( y = x^2 - 4x \)

B. \( y = 1 - x^2 \)

C. \( y = x^2 - 2x - 3 \)

D. \( y = -x^2 + 6x + 2 \)

• Draw the picture and indicate your variables on the picture.
• Write the given equations which relate the variables.
• Solve for the wanted quantities.
E. (a) The perimeter of a rectangle is 16. Express the area of the rectangle in terms of the width \( x \).
  (b) The area of a rectangle is 85. Express the perimeter of the rectangle in terms of the width \( x \).

F. \( P = (x, y) \) is a point on the curve \( y = x^2 + 1 \).
  (a) Express the distance of \( P \) from \((0,0)\) as a function \( d(x) \) of \( x \).
  (b) Express the slope of the line segment from \((0,0)\) to \( P \) as a function \( m(x) \) of \( x \).

G. A piece of wire is \( \pi y \) inches long. It is first bent into a circle.
  (a) The wire is bent into a circle. Express the area \( A(y) \) of the circle in terms of \( y \).
  (b) The wire is bent into a square. Express the area \( A(y) \) of the square in terms of \( y \).

H. The sum of two numbers is 16.
  (a) Express the product of the two numbers in terms of a single variable.
  (b) Express the sum of the squares of the two numbers in terms of a single variable.

Answers
A. \((x - 2)^2 - 4\), roots: 0,4, vertex: (2,-4).
B. \(-(x - 0)^2 + 1\), roots: \( \pm 1 \), vertex: (0,1).
C. \((x - 1)^2 - 4\), roots: -1,3, vertex: (1,-4).
D. \(-(x - 3)^2 + 11\), roots: 3 \( \pm \sqrt{11} \), vertex: (3,11).
E. (a) \( 8x - x^2 \)    (b) \( 2x + 170/x \)
F. (a) \( \sqrt{x^4 + 3x^2 + 1} \)    (b) \( (x^2 + 1)/x \)
G. (a) \( \pi y^2/4 \) sq. inches    (b) \( \pi^2 y^2/16 \) sq. inches
H. (a) \( 16x - x^2 \)    (b) \( 2x^2 - 32x + 256 \)