**Question 1**  (2 points) Peter Pan sells flying powder. Denote by \( q \) the amount of power produced (in grams) and \( p \) the price (in dollars) of one gram of power. It is given that:

(i) \( p \) and \( q \) are related via \( p^2 + q^2 = 5000 \).

(ii) The cost of producing \( q \) grams of powder is \( C(q) = 1000 + 10q \).

Answer the following:

1. Find the revenue \( (R) \) and profit \( (P) \). Express them as functions of \( q \).
2. Find the marginal cost and marginal revenue. Express them as functions of \( q \).
3. Suppose \( q = 50 \). What is the marginal revenue and marginal cost? Does increasing \( q \) increases the profit?
4. For what \( q \) is the profit maximal?

**Question 2**  (2 points) Differentiate the following functions:

1. \( 2^x + \log_3 x - 2x^\pi \)
2. \( (5^x - x)^{1.4} \)
3. \( x(e^x) \)
4. \( (\ln x)^{\ln x} \)

**Question 3**  (2 points) Use implicit differentiation to express \( \frac{dy}{dx} \) as a function of \( x \) and \( y \) in the following cases:

1. \( x^3 + xy + y^3 = 1 \)
2. \( e^x + e^y = xy + 1 \)

**Question 4**  (2 points) Find the tangent line to the curve \( x + \cos x = y^5 + y^4 - 1 \) at the point \((0, 1)\).

**Question 5**  (2 points) Find all values of \( a \) for which the tangent line to the curve \( x^2 - axy + y^2 = 1 \) at the point \((1, 0)\) passes through the point \((2, 5)\).