1. [12 points] Indicate whether each of the following statements are true or false by circling the correct answer. **You do not need to justify your answers.**

   a. [2 points] The curve defined by the parametric equations \( x = 1 - \cos t \) and \( y = t - \sin t \) has a vertical tangent line when \( t = \pi \).
   
   True  False

   b. [2 points] If the sequence \( a_n \) converges to 0 and \( \sum_{n=1}^{\infty} b_n \) converges, then \( \sum_{n=1}^{\infty} (a_n + b_n) \) converges.
   
   True  False

   c. [2 points] The graph of a polar function \( r = f(\theta) \) in the \((x, y)\)-plane has a horizontal tangent line at \( \theta = a \) if \( f'(a) = 0 \).
   
   True  False

   d. [2 points] The integral \( \int_0^1 \pi x^4 \, dx \) computes the volume of the solid obtained by rotating the graph of \( y = x^2 \) around the \( x \) axis for \( 0 \leq x \leq 1 \).
   
   True  False

   e. [2 points] Let \( \sum_{n=1}^{\infty} \frac{(-1)^n}{n^2 + 1} x^n \) be the Taylor series of \( f(x) \) about 0. Then \( f(x) \) is concave up at \( x = 0 \).
   
   True  False

   f. [2 points] The integral test says that \( \sum_{n=1}^{\infty} \frac{1}{n^2} = \int_1^{\infty} \frac{1}{x^2} \, dx \).
   
   True  False