1. [12 points] Indicate if each of the following is true or false by circling the correct answer. No justification is required.

a. [2 points] The function \( y(t) = \cos 3t + B \sin 3t + \frac{1}{9}t \) is a solution of \( y'' + 9y = 0 \) with \( y(0) = 1 \).

   True  False

b. [2 points] The value of the integral used to compute the area enclosed by a curve \( r = f(\theta) \) given in polar coordinates can be negative if \( f(\theta) \leq 0 \).

   True  False

c. [2 points] If \( f(x) \) is a continuous function such that \( \int_{1}^{\infty} f(x) \, dx \) diverges, then \( \int_{1}^{\infty} f(x)^2 \, dx \) must diverge.

   True  False

d. [2 points] If \( P(x) \) is a cumulative distribution function for the probability density function \( p(x) \), then \( 1 + P(x) \) is also a cumulative distribution function for \( p(x) \).

   True  False

e. [2 points] All solutions to the differential equation \( y' = 1 + y^4 \) are increasing functions.

   True  False

f. [2 points] Let \( P(t) \) be the cumulative distribution function of a probability density function \( p(t) \). If \( P(0) = \frac{2}{3} \) then the median of \( p(t) \) is negative.

   True  False