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] Let \( u(x) \) and \( v(x) \) be differentiable functions with \( u(0) = u(1) = 0 \), then
      \[
      \int_0^1 u(x)v'(x) \, dx = -\int_0^1 u'(x)v(x) \, dx.
      \]
      True  False
   
   b. [2 points] The function \( f(x) = \int_0^x e^{t^2} \, dt \) is decreasing for \( x < 0 \).
      True  False
   
   c. [2 points] For any differentiable function \( f(x) \)
      \[
      \int_0^x f'(t) \, dt = \frac{d}{dx} \left( \int_0^x f(t) \, dt \right).
      \]
      True  False
   
   d. [2 points] If the mass density function of a square plate (shown below) is \( \delta(y) \), an even function of \( y \) only, then the center of mass of the plate lies on the \( x \)-axis.
      
      ![Diagram](image)
      True  False
   
   e. [2 points] If we use the trapezoidal rule to approximate the integral \( I = \int_0^1 (1 + 2t) \, dt \) then \( \text{Trap}(n) \) is exactly equal to \( I \) for every \( n \).
      True  False
   
   f. [2 points] If \( f(x) \) is concave up, then the average value of \( f(x) \) on the interval \([0, 2]\) is larger than \( f(1) \).
      True  False