5. [12 points] For each of the following statements, circle True if the statement is always true and circle False otherwise. No justification is necessary.

    a. [2 points] Suppose that an object has constant density δ and center of mass $(\bar{x}, \bar{y}, \bar{z})$. If the density of the object is doubled to 2δ then the center of mass changes to $(2\bar{x}, 2\bar{y}, 2\bar{z})$.

                                              True   **False**

    b. [2 points] Every solution of the differential equation $y' = y$ is increasing.

                                              True   **False**

    c. [2 points] If $f(x)$ is a continuous function and $F(x)$ is an antiderivative of $f(x)$, then $F(x) = \int_3^x f(t)dt + K$ for some constant K.

                                              True   False

    d. [2 points] If $g(x) = \int_{-e^x}^{e^x} t^2 \, dt$ and $h(x) = \int_0^{2x} e^{t^2} dt$ then $g'(x) \leq h'(x)$ for all $x > 1$.

                                              True   False

    e. [2 points] If $w(x)$ is a positive continuous function and the series $\sum_{n=1}^{\infty} w(n)$ converges then the integral $\int_1^{\infty} w(x) \, dx$ must also converge.

                                              True   **False**

    f. [2 points] Suppose that a_n is a decreasing sequence and $0 \leq a_n \leq 1$ then $b_n = \cos(a_n)$ is a convergent sequence.

                                              True   False