

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  $\delta$  and center of mass  $(\bar{x}, \bar{y}, \bar{z})$ . If the density of the object is doubled to  $2\delta$  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