1. (2 points each) Circle “True” or “False” for each of the following problems. Circle “True” only if the statement is always true. No explanation is necessary.

(a) Suppose that a differentiable function \( h \) and its derivative, \( h' \), are continuous. If \( h'(x) < 0 \) for all \( a \leq x \leq b \) then every left-hand sum estimate of \( \int_a^b h(x)dx \) will be an overestimate.

True  False

(b) For \( f(x) \) a continuous function, \( \int_{-1}^{1} f(x)dx = 2 \int_0^{1} f(x)dx. \)

True  False

(c) If \( \int_0^{3} f(x)dx = 5 \), then \( \int_0^{3} 3f(x)dx = 15. \)

True  False

(d) If \( Z(t) \) is an anti-derivative for \( z(t) \), then \( Z(t + 5) \) is also an anti-derivative for \( z(t) \).

True  False

2. (3 points each) Explain in words what the following represent:

(a) \( \int_2^{6} f(t)dt \) where \( f(t) \) is the rate at which people are lining up outside of Target waiting for the store to open at 6 am, where \( t \) is in hours after midnight on the day after Thanksgiving,

\[ \int_2^{6} f(t)dt \] is the total number of people who line up between 2:00 AM and 6:00AM.

(b) \( \int_0^{4} a(t)dt \) where \( a(t) \) is acceleration of an object in \( \text{ft/sec}^2 \) and \( t \) is in seconds

\[ \int_0^{4} a(t)dt \] is the total change in velocity (in feet per second) of the object between the times \( t = 0 \) and \( t = 4. \)

(c) \( \frac{1}{4} \int_5^{9} r(t)dt \) where \( r(t) \) is rainfall in inches per hour and \( t \) is in hours since noon

\[ \frac{1}{4} \int_5^{9} r(t)dt \] is the average rainfall (in inches per hour) between 5:00 PM and 9:00 PM.