**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 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.