Homework 2.6 – Integrals of Linear and Quadratic Functions

1. (1 pt) alfredLibrary/AUCI/chapter2/lesson6/question21pet.pg

Evaluate the following indefinite integrals:

(a) $\int (-1t+5)\,dt =$ __________

(b) $\int (5t^2+6t+8)\,dt =$ __________

2. (1 pt) alfredLibrary/AUCI/chapter2/lesson6/question31pet.pg

Evaluate the following definite integrals using the Fundamental Theorem of Calculus:

(a) $\int_{-9}^{-8} (6u-4)\,du =$ __________ $\Big|$ ______ = ________

(b) $\int_{-2}^{4} (-4u+8)\,du =$ __________ $\Big|$ ______ = ________

3. (1 pt) alfredLibrary/AUCI/chapter2/lesson6/defintegraloflinear4p.pg

A population of cattle is increasing at a rate of $P'(t) = 600+70t$ cows per year, where t is measured in years. By how much does the population increase between the 5th and the 8th years?

Total Increase = ______________ cows

4. (3 pts) alfredLibrary/AUCI/chapter2/lesson6/rectilinearmotion1pet.p

All of your answers require **units**.

A stone is thrown straight up from the edge of a roof, 175 feet above the ground, at a speed of 16 feet per second. Recall that the acceleration due to gravity is -32 feet per second squared.

(a) Find the equation for the object's velocity using the relationship $v = \int -32dt$, remembering that the initial velocity is 16 feet per second. ______________

(b) Find the equation for the object's position above the ground using the relationship $s = \int v dt$, remembering that the initial position is 175 feet. ______________

(c) How high is the stone after 2 seconds? ______________

(d) What is the velocity of the stone after 2 seconds? ______________

(e) At what time does the stone hit the ground? (i.e., when is its position zero?) ______________

(f) What is the velocity of the stone when it hits the ground? ______________

(g) The net change in the stone's position from time 0 to time 2 is

$s(\_\_) - s(\_\_)$

= __ $\int$__ ____ dt

= _____ $\Big|$ _____

= ______________

5. (1 pt) alfredLibrary/AUCI/chapter2/lesson6/riemannunits1pet.pg

The function $W'(t) = 20t^3\ \frac{\text{L}}{\text{hr}}$ measures the rate at which water is flowing through a pipe at time t hr. Although we have not proved it yet, the Fundamental Theorem works for quadratic and cubic functions. That is, the net amount of water that has flowed through the pipe from $t = 2.5$ hr to $t = 6.1$ hr is given by

$W(\ \_\_\ ) - W(\ \_\_\ ) = \_\_\int\_\_\ (\ \_\_\_\ )\ dt$

Since we do not yet know an antiderivative W of the cubic function W', we will estimate the integral using left-hand and right-hand approximations. Divide the interval [2.5, 6.1] into 4 subintervals of equal width $\Delta t =$ ___.

The left-hand approximation is given by

$L_4 = ($
___ +
___ +
___ +
___
$) \cdot$ ___ =

____

(Include **units** in your final answer.)

The right-hand approximation is given by

$R_4 = ($
___ +
___ +
___ +
___
$) \cdot$ ___ =

____

(Include **units** in your final answer.)

By the way, the exact answer is 6727.61 L. How close are the left- and right-hand approximations to the exact answer?