# READING ASSIGNMENT 03

NAME: SOLUTIONS

§5.6 (Rate of change), §5.7 (Substitution)

## LEARNING OBJECTIVES

By the end of this lesson, you will be able to:

- use calculus to solve simple word problems and interpret the answer in the original context,

- compute definite and indefinite integrals using the substitution method.

## REVIEW

- You may wish to review dimensional analysis. One resource is here:

    https://www.chem.tamu.edu/class/fyp/mathrev/mr-da.html

## READING

- Read section 5.6 in the textbook. Skip the "Total Versus Marginal Cost" subsection.

- Read section 5.7 in the textbook, or watch the YouTube video at the URL below.

    https://www.youtube.com/watch?v=IGgUAFlVa-A

## QUESTIONS

(1) A hot metal object is submerged in cold water. The rate at which the object cools (in degrees per minute) is a function $f(t)$ of time. What quantity does $\int_0^T f(t)\, dt$ represent?

ANSWER: The total degrees the object has cooled in $T$ minutes.

(2) Which of the following are naturally represented as derivatives, and which are naturally represented as integrals?

    (a) Velocity of a train       ANSWER: Derivative.

    (b) Rainfall during a six-month period       ANSWER: Integral.

    (c) Mileage per gallon of a car       ANSWER: Derivative.

    (d) Increase in world population from 1800 to 1900       ANSWER: Integral.

(3) Which of the following integrals are a candidates for the substitution method?

    (a) $\displaystyle\int 5x^4 \sin(x^5)\,dx$

    (b) $\displaystyle\int \sin^5(x)\cos(x)\,dx$

    (c) $\displaystyle\int x^5 \sin(x)\,dx$

    (d) $\displaystyle\int \sin(x)\cos(x)\,dx$

    (e) $\displaystyle\int \sin(x^5)\cos(x)\,dx$

SOLUTION: (a), (b), and (d) are all candidates for the substitution method. For (a), substitute $u = x^5$, $du = 5x^4\,dx$. For (b) and (d), substitute $u = \sin(x)$, $du = \cos(x)\,dx$.