Chapter 8 Review

1. **(Lesson 8.2)** Compute $\int_1^3 \left(x^2+2\right)dx$ using the definition of the definite integral with right-hand endpoints.

   (a) $\Delta x =$ _____

   (b) $x_k^* =$ _____

   (c) $f\left(x_k^*\right)\Delta x =$ _____

   (d) $\sum_{k=1}^{n} f\left(x_k^*\right)\Delta x =$ _____ (closed form)

   (e) $\int_1^3 \left(x^2+2\right)dx = \lim_{n\to\infty}\left[\sum_{k=1}^{n} f\left(x_k^*\right)\Delta x\right] =$ _____

2. **(Lesson 8.2)** Suppose an object is moving along a line with velocity $v(t) = -t^2 + 8t - 12$ miles per hour. Without using your calculator, find the displacement and the total distance traveled by the object during the time interval [0, 4]. (HINT: The displacement is the integral of the velocity, and the total distance is the integral of the speed.)

3. **(Lesson 8.3)** The function $f(x) = 2x^3 + 5x$ satisfies the hypothesis of the Mean Value Theorem on the interval [–1, 2]. Find all values of c in (–1, 2) that satisfy the conclusion of the theorem.

4. **(Lesson 8.4)** Use Part 1 of the Fundamental Theorem of Calculus to evaluate each definite integral.

   (a) $\int_1^4 \left(2+\frac{1}{x}+\frac{3}{x^4}\right)dx$ (b) $\int_4^9 \frac{5}{\sqrt{x}}dx$ (c) $\int_{-1}^1 \frac{3}{1+x^2}dx$

5. **(Lesson 8.5)** Use Part 2 of the Fundamental Theorem of Calculus to compute each derivative.

   (a) $\frac{d}{dx}\left(\int_x^6 t^3 \ln(5t)dt\right)$ (b) $\frac{d}{dx}\left(\int_{-1}^{x^3} \frac{t+\cos\left(t^2\right)}{e^t}dt\right)$ (c) $\frac{d}{dx}\left(\int_{2x}^0 \frac{\tan(t)}{5t+1}dt\right)$

6. **(Lesson 8.6)**

(a) For the indefinite integral $\int x^6\sqrt{12+x^7}\,dx$, a good choice for a *u*-substitution is

$u =$ _____ $du =$ _____

After making the substitution into the integral, we have $\int$ _____ = _____ .

Therefore, $\int x^6\sqrt{12+x^7}\,dx =$ _____ .

(b) For the indefinite integral $\int \frac{x+2}{x^2+4x+5}\,dx$, a good choice for a *u*-substitution is

$u =$ _____ $du =$ _____

After making the substitution into the integral, we have $\int$ _____ = _____ .

Therefore, $\int \frac{x+2}{x^2+4x+5}\,dx =$ _____ .

7. **(Lesson 8.6)**

(a) For the definite integral $\int_2^4 x^3\left(2+2x^4\right)^2\,dx$, a good choice for a *u*-substitution is

$u =$ _____ $du =$ _____

By Method 1, after making the substitution, changing the limits of integration, and simplifying, we obtain

$$\int_2^4 x^3\left(2+2x^4\right)^2\,dx = \int_{\_\_}^{\_\_} \_\_\_\_\_ = \_\_\_\_\_\Big|_{\_\_}^{\_\_} = \_\_\_\_\_ .$$

(b) For the definite integral $\int_1^{e^\pi} \frac{\sin(\ln(x))}{x}\,dx$, a good choice for a *u*-substitution is

$u =$ _____ $du =$ _____

By Method 1, after making the substitution, changing the limits of integration, and simplifying, we obtain

$$\int_1^{e^\pi} \frac{\sin(\ln(x))}{x}\,dx = \int_{\_\_}^{\_\_} \_\_\_\_\_ = \_\_\_\_\_\Big|_{\_\_}^{\_\_} = \_\_\_\_\_ .$$