MATH 152 Assignment 1, Spring 2024.

WebAssign Exercises

4.9 Exercises 6, 18, 37, 45

5.1 Exercises 3, 24

5.2 Exercises 27, 35, 41, 53

5.3 Exercises 3, 9, 35, 63

Written Exercises

1 Differentiate the following functions of x :

(a) $3x^2 + 2x^{-1}$, (b) $\ln(1-x^2) + xe^{-2x}$, (c) $\dfrac{\ln x}{x^2}$, (d) $3\sin(2x) - \sqrt{x}\cos x$.

2 (Section 4.9) A car is travelling at velocity $v(t) = 30t(4-t)$ kmph.

(a) What is the maximum velocity of the car on $0 \le t \le 4$?

(b) How far does the car travel on $0 \le t \le 4$?

Use a derivative to answer (a) and an antiderivative for (b).

3 (Section 4.9) A car is travelling at 72 kmph. If the driver hits the brakes and decelerates at a constant rate of 10 m/s^2, how long will it take before the car stops and how far will the car travel before it stops. Note: 72 kmph = 20 m/s.

4 (Section 5.2) Evaluate the following sums :

(a) $\sum_{i=0}^{4} i^2$ (b) $\sum_{i=1}^{n}(4i-4)$ (c) $\sum_{k=1}^{n-1}(6k - 6k^2/n)$.

5 (Section 5.1)

(a) Estimate the area under the graph of $f(x) = 4 - x^2$ from $x = -1$ to $x = 2$ using three approximating rectangles of width 1 and right end points.

(b) Repeat part(a) using left endpoints.

(c) Repeat part(a) using midpoints.

6 (Section 5.1)

(a) Let $f(x) = 1 + x$ and A be the area bounded by $f(x)$, the x axis, $x = 0$ and $x = 2$. Sketch A and use the formula for the area of a trapezoid to calculate A.

(b) Construct the formula for R_n (the area of n right rectangles) in sigma notation for the area A in part (a). Simplify the formula and evaluate $\lim_{n\to\infty} R_n$. Show your working.

7 (Section 5.2) If $\int_0^2 f(x)dx = 3$ and $\int_0^2 g(x)dx = 1$ calculate $\int_0^2 (3f(x) - 2g(x))\,dx$. See Properties of the Definite Integral.

8 (Section 5.3) Evaluate $\int_1^9 \frac{3}{\sqrt{z}}dz$ using the Fundamental Theorem of Calculus.

9 (Section 5.3) Express the area in question 5 as a definite integral then evaluate the definite integral using the Fundamental Theorem of Calculus. Which estimate of (a), (b), (c) in question 5 is the most accurate?

10 (Section 5.3) Show that $\int_a^b f(x)g(x)dx \neq \left(\int_a^b f(x)dx\right)\left(\int_a^b g(x)dx\right)$ in general.
Hint: Consider $\int_0^1 x(1-x)dx$.