MATH 152 Assignment 1, Fall 2019.

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WebAssign exercises: Due 10pm Tuesday September 17th

5.1 Exercises 15, 24, 26

5.2 Exercises 21, 34, 36, 43, 49

5.3 Exercises 3, 9, 27, 55

5.4 Exercises 8, 11, 25, 28, 51

5.5 Exercises 1, 4, 44, 71, 88

Written exercises: Due 10pm Wednesday September 18th

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 5.1) Exercise 5(a) and 5(b).

3 (Section 5.2) Calculate $\int_0^2 \frac{1}{1+x}dx$ using the midpoint rule with $n = 4$ intervals. Give the answer as an exact fraction.

4 (Section 5.2) Let $f(x) = x^2$ on $[0, 1]$. If we use the midpoint rule M_n with n subintervals of width $\Delta x = 1/n$ so that

$$M_n = \sum_{i=1}^{n} \Delta x f\left(\frac{(i-1)\Delta x + i\Delta x}{2}\right) = \sum_{i=1}^{n} \frac{1}{n}\frac{(i/n - 1/n + i/n)^2}{4}$$

show that $\lim_{n\to\infty} M_n = \dfrac{1}{3}$.

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

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

7 (Section 5.4) Show that $\int \cos(x)^2 dx = \frac{1}{2}x + \frac{1}{4}\sin 2x + C$ by differentiating both sides and using the trig identities $\sin 2A = 2\sin A\cos A$ and $\cos 2A = 2\cos(A)^2 - 1$.

8 (Section 5.4) Water flows out of a storage tank at a rate of $r(t) = 100 - 10t$ litres per minute. Find the amount of water that flows out of the tank during $0 \leq t \leq 10$.

9 (Section 5.5) Exercise 79: show that the first area equals the second area.