ENGR121 Assignment 7
DUE: 11:59pm Wednesday 22 May 2024

Submission is online via the Submission link in the web left bar. Ensure your submission is a single pdf file, with a name that ends with the characters *yourUserName.pdf* . View your submission after uploading it.

Please keep every number in your work in its exact form. For examples, please write π *instead of* $3.1415\ldots$, $\sqrt{2}$ *instead of* $1.4142\ldots$, $\frac{4}{3}$ *instead of* $1.333\ldots$, *and even* $\frac{1}{2}$ *instead of* 0.5, *etc. Please also use* $\frac{4}{3}$ *instead of* $1\frac{1}{3}$, *as the later bounds to be confused with* $1 \cdot \frac{1}{3}$.

1. Find the following Indefinite Integrals:

   (a) $\int (\sqrt[5]{2x})^4 dx$ (c) $\int 3e^{27x} dx$ (e) $\int 5\sinh(3x+1) dx$

   (b) $\int \frac{4}{3x^{16}} dx$ (d) $\int (14x^5 - 10x^3 - 2) dx$ (f) $\int \sin\frac{5t}{2} dt$

2. Suppose $\int_0^{13} f(x)dx = 7$, $\int_0^{20} f(x)dx = -3$ and $\int_0^{20} g(x)dx = 5$. Evaluate the following Definite Integrals (Show All Working):

   (a) $\int_{13}^{20} f(x)dx$ (c) $\int_0^{20} (2g(x) - 3f(x))dx$

   (b) $\int_0^{20} 7g(x)dx$ (d) $\int_{13}^{0} 4f(x)dx$

3. Evaluate the following Definite Integrals (Show All Working):

   (a) $\int_0^7 \ln(6) dx$ (c) $\int_6^4 (\sqrt[3]{t})^4 dt$ (e) $\int_0^1 (4x^4 - 3x^3 + 5x - 7) dx$

   (b) $\int_0^{\pi} \sin(6x+3) dx$ (d) $\int_{-2}^{0} (4e^{-7x} + e^4) dx$ (f) $\int_{-\pi}^{\pi} |\sin(x)| dx$

4. Find the following improper integrals. Show all working

   (a) $\displaystyle\int_{-\infty}^{0} e^x dx$ (b) $\displaystyle\int_{-10}^{10} \frac{1}{(x+3)^3} dx$

5. Use substitution to solve the following Integrals. Show All Working. Do not simplify your answer.

   (a) $\int_0^1 \frac{5x^2}{\sqrt[5]{x^3+7}} dx$ (c) $\int 3\cos(x)e^{-4\sin(x)} dx$ (e) $\int x^5(4x^6+7)^6 dx$

   (b) $\int_4^5 \frac{\cos(\ln(7x)+3)}{x} dx$ (d) $\displaystyle\int \frac{x^3}{2x^4+3} dx$

6. What is the average value $f(x) = e^{3x}$ on the interval $[1, 4]$? Show All Working.

7. Find the r.m.s value of $i(t) = 2\cos(4t)$ across $[0, \frac{\pi}{2}]$? Show your working.