

DAWSON COLLEGE
Mathematics Department

FINAL EXAMINATION
Calculus II (201-NYB-05)-Open
Winter 2022

Instructor:
Noushin Sabetghadam

Student Name: _____

Student ID. #: _____

Instructions:

Print your name and ID number in the provided space.

Solve the problems in the space provided for each question and show all your work clearly and indicate your final answer.

Only calculators Sharp EL 531.X/ XG/XT are permitted.

The last page is a copy of the formula sheet. Note that the examination booklet must be returned intact.

This examination consists of 13 questions. Please ensure that you have a complete examination booklet before starting.

Q1/6	Q2/6	Q3/6	Q4/20	Q5/6	Q6/6	Q7/8	Q8/6	Q9/6	Q10/6	Q11/6	Q12/12	Q13/6	Sum

(1) (6 marks) Use ONLY the Riemann Sum technique to evaluate the integral $\int_1^3 (2x^2 - 3x) dx$.

(2) (6 marks) Use the Fundamental Theorem of Calculus to find the derivative of the given function.

$$g(x) = \int_{\cos x}^{3x^2} \frac{t+1}{t} dt$$

(3) (6 marks) Find the average value of $f(x) = \frac{1}{x^2} \cos\left(\frac{2}{x}\right)$ over the interval $[1;4]$.

(4) Find the following integrals.

(a) (6 marks) $\int \sin^4(3x) \cos^5(3x) dx$

(b) (6 marks) $\int \frac{dx}{(16 - x^2)^{\frac{3}{2}}}$

(c) (8 marks) $\int \frac{3x^2 - 3x + 20}{x(x^2 + 4)} dx$

- (5) (6 marks) Find the volume of the solid obtained when the region bounded by $y = \frac{1}{x-1}$ and $y = x - 1$ is rotated about the x-axis.

- (6) (6 marks) Compute the following improper integral or show it diverges.

$$\int_1^2 x e^x dx$$

(8) (6 marks) Find the general solution of the differential equation $(y^2 + 1)e^x - yy' = 0$.

(9) (6 marks) Determine whether the following sequence is convergent or divergent. Find its limit if it converges.

$$a_n = \frac{n+1}{n} 3^n$$

(10) (6 marks) Determine whether the series converges or diverges. If it converges, find its sum.

$$\sum_{n=0}^{\infty} \frac{5^{(n+1)} 2^{(2n)}}{10^{(n)}}$$

(12) Determine whether the given series are convergent or divergent. Justify your answer.

(a) (4 marks) $\sum_{n=0}^{\infty} \frac{1+5n}{4n^2+2n+1}$

(b) (4 marks) $\sum_{n=3}^{\infty} \frac{\ln n}{n}$

(c) (4 marks) $\sum_{n=0}^{\infty} \frac{4n}{3n^3+n}$

- (13) (6 marks) Use the Simpson's rule with $n = 4$ to approximate the value of the definite integral. Round the final answer up to five decimal places.

$$\int_1^3 \frac{e^x}{x+1} dx$$

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Final Answers

(1) $\frac{20}{3}$

(2) $g'(x) = \frac{p}{1} \frac{p}{3x^2 + p} \frac{p}{3x^2} 6x + \frac{p}{1} \frac{p}{\cos x + p} \frac{p}{\cos x} \sin x$

(3) $f_{ave} = \frac{1}{6}$

(4) (a) $I = \frac{\sin^5(3x)}{15} - \frac{2 \sin^7(3x)}{21} + \frac{\sin^9(3x)}{27} + C$

(b) $I = \frac{x}{64} - \frac{x^2}{16}$

(c) $I = 5 \ln|x| - \ln(x^2 + 4) - \frac{3}{2} \arctan \frac{x}{2} + C$

(5) $V = \frac{1}{6}$

(6) $I = e^2$; Convergent

(7) (a) $x = 10000$; $p = 500\$$

(b) 163,768\$

(8) $y = \frac{p}{C e^{2e^x} - 1}$

(9) It converges to 3.

(10) It converges to $\frac{19}{150}$.

(11) $\sum_{n=0}^{\infty} 2(-1)^{n+1}(x-2)^n$, the radius of convergence is 1.

(12) (a) Divergent using the test for divergence.

(b) Divergent using the integral test.

(c) Convergent using limit comparison test.

(13) 9.64703