NAME ______________________________ Rec. Instructor: __________________

Signature ______________________________ Rec. Time ____________

CALCULUS II - FINAL EXAM Part 2
August 2, 2019

Show all work for full credit. No books, notes or calculators are permitted. The point value of each problem is given in the left-hand margin. You have 1 hour and 15 minutes.

Problem	Points	Points Possible	Problem	Points	Points Possible
1		10	6		10
2		10	7		10
3		10	8		10
4		10	9		10
5		10	Total Score		200

$\frac{d}{dx}\tan x = \sec^2 x$ $\frac{d}{dx}\sec x = \sec x \tan x$ $\frac{d}{dx}b^x = b^x \ln(b)$

$\frac{d}{dx}\sin^{-1}(x) = \frac{1}{\sqrt{1-x^2}}$ $\frac{d}{dx}\tan^{-1}(x) = \frac{1}{1+x^2}$ $\frac{d}{dx}\sec^{-1}(x) = \frac{1}{|x|\sqrt{x^2-1}}$

$$\int \tan x \; dx = -\ln|\cos x| + C \qquad \int \sec x \; dx = \ln|\sec x + \tan x| + C$$

$$\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}(\frac{x}{a}) + C \qquad \int \frac{dx}{a^2+x^2} = \frac{1}{a}\tan^{-1}(\frac{x}{a}) + C$$

$$\int \sin^n x \; dx = -\frac{\sin^{n-1} x \cos x}{n} + \frac{n-1}{n}\int \sin^{n-2} x \; dx,$$

$$\int \cos^n x \; dx = \frac{\cos^{n-1} x \sin x}{n} + \frac{n-1}{n}\int \cos^{n-2} x \; dx,$$

$$\int \tan^n x \; dx = \frac{\tan^{n-1} x}{n-1} - \int \tan^{n-2} x \; dx \, ,$$

$$\int \sec^n x \; dx = \frac{\sec^{n-2} x \tan x}{n-1} + \frac{n-2}{n-1}\int \sec^{n-2} x \; dx$$

$M_x = \frac{1}{2}\int_a^b f(x)^2 - g(x)^2 \; dx \, ,$ $M_y = \int_a^b x(f(x) - g(x)) \; dx \, .$

$|R_n(x)| \le \frac{K}{(n+1)!}|x-a|^{n+1}$, with $K = \max_{a \le c \le x} |f^{(n+1)}(c)| \, .$

$\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n \, ,$ $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!},$ $\ln(1+x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}x^n}{n}$

$\sin x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{(2n+1)!},$ $\cos x = \sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$

$\int_a^b \sqrt{1+(dy/dx)^2} \; dx \, ,$ $\int_a^b 2\pi r\sqrt{1+(dy/dx)^2} \; dx.$

$\int_a^b y(t)x'(t) \; dt \, ,$ $\int_a^b \sqrt{x'(t)^2 + y'(t)^2} \; dt \, ,$ $\int_a^b 2\pi r\sqrt{x'(t)^2 + y'(t)^2} \; dt \, ,$

$\frac{1}{2}\int_a^b r^2 \; d\theta \, ,$ $\int_a^b \sqrt{r(\theta)^2 + r'(\theta)^2} \; d\theta \, ,$ $\int_a^b \sqrt{r^2 + \left(\frac{dr}{d\theta}\right)^2} d\theta$

(10)
1. Consider the curve with parametric equations $x = 4t^3 - t^2$ and $y = t^2 + 2t$

(a) For which values of t is the slope horizontal?

(b) For which values of t is the slope vertical?

(c) What is the area from $1 \leq t \leq 2$?

(10)

2. Evaluate the improper integral or show that it diverges

$\int_0^\infty xe^{-5x^2}\,dx$

(10)

3. Does the series conditionally converge, absolutely converge, or diverge? Name all tests used.

$$\sum_{n=1}^{\infty} \frac{\cos(\pi n)}{n}$$

(10)

4. $$\sum_{n=2}^{\infty} \frac{4n^2+1}{3n+2n^5}$$

(10)
5. (a) Convert the polar equation $r = 4\sin(\theta)$ to a rectangular or cartesian equation.

(b) Find the arc length in polar coordinates for polar equation part (a) from $0 \leq \theta \leq \pi$.

(10)

6. Find the interval of convergence of the power series $\sum_{n=1}^{\infty} \frac{(x+2)^n}{n!\,3^n}$. (Make clear the status of any end points.)

(10)

7. $\int x^4 \ln|x| \; dx$

(10)

8. $\int \frac{dx}{3+x^2}$

(10)

9. Does the series conditionally converge, absolutely converge, or diverge? Name all tests used.

$$\sum_{n=1}^{\infty}(-1)^n \frac{n!}{3n!}$$