NAME ____________________ Rec. Instructor: ____________________

Signature ____________________ Rec. Time ____________________

CALCULUS II - FINAL EXAM Part 1
August 1, 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		90

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(10)

1. $\displaystyle\int \frac{x^2\ dx}{\sqrt{1-x^2}}$

(10)

2. $\displaystyle\int \frac{7-3x}{x^2+2x-3}dx$

(10)

3. Find the third degree Taylor polynomial $T_3(x)$ for the function $f(x) = \sin(x)$ centered at $x = 4$.

(10)
4. Does the series conditionally converge, absolutely converge, or diverge? Name all tests used
$\sum_{n=1}^{\infty} \frac{(-1)^n}{n!}$

(10)
5. Find the arc length from of $y = 2(1+x)^{\frac{3}{2}}$ from $x = 0$ to 1

(10)

6. Solve the initial value problem, $\dfrac{dy}{dt} = \dfrac{e^{-3t}}{\sin(y)}$, $y(0) = 0$. It's not necessary to solve for y.

(10)
7. Does the series conditionally converge, absolutely converge, or diverge? Name each test used

$$\sum_{n=3}^{\infty} \frac{e^n}{\frac{1}{n} - 9}$$

(10)
8. (a) Use an appropriate series from the cover sheet to find the Maclaurin series for

$$\frac{1}{1+3x}$$

(b) Differentiating (a) gives $\frac{-3}{(1+3x)^2}$. Find its Maclaurin series.

(10)
9. Determine the center of mass for $y = x^3$ and $y = x$ from $x = 0$ to 1