1	2	3	4	5	6	7	8	9	10	11	12	Fall 2018

DO NOT WRITE IN THESE BLOCKS

NAME____ MTH 1322 - CALCULUS II

INSTRUCTOR___________________________________

DIRECTIONS: Box your final answers. You must show enough of your work so that the reader can follow what you did. If it is possible to find an exact answer by taking an algebraic approach, you may not receive full credit for an approximation. This means that whenever possible, you should write your final answers in exact form (π, $\sqrt{3}$, $\ln 2$, etc.) and not in decimal form (3.14159, 1.73205, 0.693145, etc.)

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1. Use integration by parts to evaluate $\displaystyle\int_1^2 x \ln x \, dx$.

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2. Use a trigonometric substitution to evaluate $\displaystyle\int \frac{dx}{(1+x^2)^{3/2}}$.

3. Use a partial fraction decomposition to evaluate $\int \frac{x^2+2x+1}{x^2(2x+1)}\,dx$.

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4. Use L'Hospital's rule (perhaps repeatedly) to evaluate the limit.

(a) $\lim_{x\to 0} \frac{1-\cos x}{x^2}$

(b) $\lim_{x\to\infty} x^2 e^{-x}$

5. Consider the solid that is obtained by rotating the region below the graph $y = x^{-1}$ over $[1, \infty)$ about the x-axis. Use the disk method to express the volume of the solid as an improper integral and then evaluate the improper integral (or state that it diverges.)

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6. Use separation of variables to solve the initial value problem $\dfrac{dy}{dx} = \dfrac{xy}{\sqrt{1-x^2}}$, $y(0) = 1$.

7. A ball is dropped from a height of 6 feet and begins to bounce. Each time it strikes the ground, it returns to two-thirds of its previous height. What is the total vertical distance travelled by the ball if it bounces infinitely many times? *Hint*: Use the formula for the sum of a geometric series.

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8. Use the integral test or a comparison test to determine whether the series converges or diverges.

   (a) $\displaystyle\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

   (b) $\displaystyle\sum_{n=1}^{\infty} \frac{1}{\sqrt{n^3+1}}$

9. Determine whether the series $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n+1)!}$ converges absolutely, conditionally, or not at all.

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10. Find the interval of convergence of the power series $\displaystyle\sum_{n=1}^{\infty} \frac{(x-1)^n}{n\,2^n}$. Pay attention to the endpoints.

11. Find the Maclaurin series of $f(x) = \dfrac{1}{(1+x)^2}$.

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12. Use term-by-term integration to evaluate $\int \sin(x^2)\,dx$ as a power series.

Table of Trigonometric Integrals

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

$$\int \cot x\,dx = -\ln|\csc x| + C = \ln|\sin x| + C$$

$$\int \sec x\,dx = \ln|\sec x + \tan x| + C$$

$$\int \csc x\,dx = -\ln|\csc x + \cot x| + C$$

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

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

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

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

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

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