Math 1B Final Review 1

April 5, 2019

Topics to Review:

- Integration by u-substitution.
- Integration by integration by parts.
- Trigonometric integrals, and integration by trigonometric substitution.
- Integration by partial fraction decomposition.
- Arc length and surface area.

Question 1

Compute the following integrals.

$$\int \frac{(\ln(x))^2}{\sqrt{x}}dx$$

$$\int \frac{1}{x\ln(x)\ln(\ln(x))}dx$$

$$\int e^{-2x}\cos(3x)dx$$

$$\int \frac{x}{\sqrt{x^2-4}}dx$$

$$\int \frac{x^4-x}{x^3-x}dx$$

$$\int \sin^2(x)\cos^2(x)dx$$

$$\int \frac{x^2+2x}{(x^2+4x+5)^2}dx$$

$$\int \frac{x^2}{(x+1)(x^2-4x+4)}dx$$

$$\int \frac{\sqrt{x}}{x+1}dx$$

$$\int \frac{\tan^3(x)}{\sec(x)}dx$$

Question 2

Consider the function $y = e^x$. Suppose the graph is rotated around the x-axis. What is the surface area of the resulting surface of revolution from $x = -1$ to $x = 1$? Use the integration formula

$$\int \sec^3(\theta)d\theta = \frac{1}{2}\sec(\theta)\tan(\theta) + \frac{1}{2}\ln|\sec(\theta) + \tan(\theta)| + C$$

Question 3

Consider the function $y = \frac{1}{3}(1 + 4x)^{3/2}$. What is arc length of this curve from $x = 1$ to $x = 3$?

Question 4

Find the arc length of the function

$$y = \frac{1}{16}x^4 + \frac{1}{2x^2}$$

from $x = 1$ to $x = 2$. Then, find the surface area of the solid of revolution from $x = 1$ to $x = 2$ obtained from rotating this function around the x-axis.

Question 5

Use the integral test to determine whether the following two series converge absolutely, converge conditionally, or diverge.

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

$$\sum_{n=1}^{\infty}(-1)^n\frac{n^2}{e^n}$$