

Name _____ Rec. Instr. _____
 Signature _____ Rec. Time _____

Math 221 – Exam 2 – February 27, 2018

No books, calculators, or notes are allowed. Please make sure that your cell phone is turned off. You will have 75 minutes to complete the exam.

SHOW YOUR WORK!

Problem	Points	Points Possible	Problem	Points	Points Possible
1		14	6		10
2		6	7		9
3		6	8		9
4		10	9		9
5		18	10		9

Total Score

$$\sin(ax) \sin(bx) = \frac{1}{2} \cos((a-b)x) - \frac{1}{2} \cos((a+b)x)$$

$$\cos(ax) \cos(bx) = \frac{1}{2} \cos((a-b)x) + \frac{1}{2} \cos((a+b)x)$$

$$\sin(ax) \cos(bx) = \frac{1}{2} \sin((a-b)x) + \frac{1}{2} \sin((a+b)x)$$

$$\sin^2(x) = \frac{1 - \cos(2x)}{2}$$

$$\cos^2(x) = \frac{1 + \cos(2x)}{2}$$

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

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

$$\int \frac{dx}{\sqrt{a^2 - x^2}} = \arcsin\left(\frac{x}{a}\right) + C$$

$$\int \frac{dx}{a^2 + x^2} = \frac{1}{a} \arctan\left(\frac{x}{a}\right) + C$$

$$\int \frac{dx}{x\sqrt{x^2 - a^2}} = \frac{1}{a} \operatorname{arcsec}\left(\frac{x}{a}\right) + C$$

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

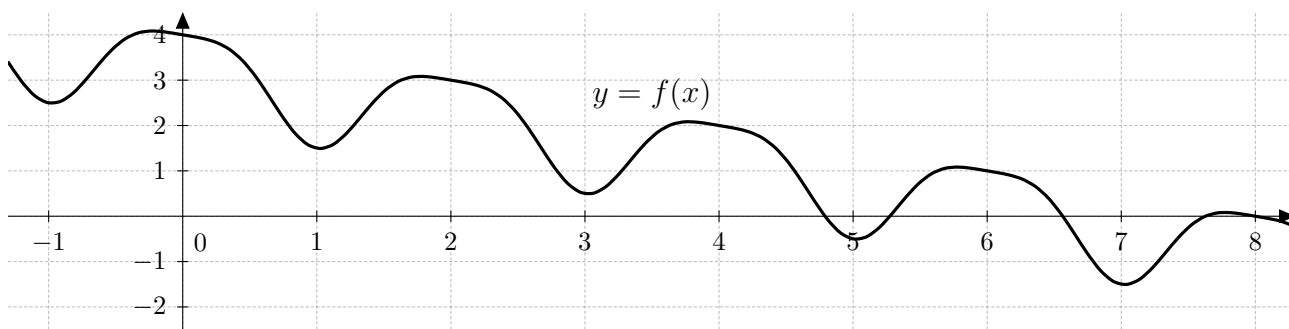
$$\int \cos^n(x) \, dx = \frac{\cos^{n-1}(x) \sin(x)}{n} + \frac{n-1}{n} \int \cos^{n-2}(x) \, dx$$

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

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

$$M_x = \frac{\rho}{2} \int_a^b (f(x)^2 - g(x)^2) \, dx$$

$$M_y = \rho \int_a^b x (f(x) - g(x)) \, dx$$



1. (7 points each) $y = f(x)$ is plotted above. Find the following approximations

to $\int_0^8 f(x) dx$.

A. T_4

B. S_4

2. (6 points) **Write** an integral that calculates the surface area of the volume generated by rotating the curve $y = x^2 + x + 7$ from $x = 0$ to $x = 5$ around the x -axis. **You do not need to evaluate the integral!**

3. (6 points) Find the center of mass $\bar{x}$ if there is a mass of 4 kg at $x = 1$ ft, a mass of 2 kg at $x = 3$ ft, and a mass of 4 kg at $x = 10$ ft.

4. (10 points) Find the center of mass (centroid) for the area between $y = x$ and $y = x^2$.

5. (9 points each) Evaluate the following integrals. (Use proper limit notation.)

A. $\int_0^{1/2} \frac{dx}{x \ln(x)}$

B. $\int_0^{\infty} e^{-2x} dx$

6. (10 points) Find the arc length of $y = \frac{2}{3} \cdot x^{3/2}$ from $x = 0$ to $x = 3$.

7. (9 points) Evaluate $\int \frac{3x + 5}{x^2 + 3x + 2} dx$.

8. (9 points) Evaluate $\int \frac{2x^2 + 2x + 1}{x^3 - x^2} dx$.

9. (9 points) A spring with a natural length of 1 m requires 10 J to stretch the spring from 1 m to 3 m. How much work is required to stretch the spring from 1 m to 5 m?

10. (9 points) Find the work done by winding up a hanging cable of length 10 ft and weight-density 5 lb/ft.