NAME _____ Rec. Instructor: _____

Signature _____ Rec. Time _____

CALCULUS II - EXAM 1
July 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 75 minutes.

Problem	Points	Possible	Problem	Points	Possible
1		10	7		10
2		10	8		10
3		10	9		10
4		10			
5		10			
6		10	Total Score		90

You are free to use the following formulas on any of the problems.

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

$$\sin^2(x) = \tfrac{1}{2}\left(1 - \cos(2x)\right), \qquad \cos^2(x) = \tfrac{1}{2}\left(1 + \cos(2x)\right),$$

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

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

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

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

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

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

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

Work $= \int$ Force $\cdot dx$; Units of work: ft-lbs, newton-meters = joules;

Hooke's Law for springs: $F = kx$, where x is the distance stretched from rest position.

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

(10) **1.** $\displaystyle\int \frac{2x^2 + x + 10}{x - 4}\, dx$

(10) **2.** A 50m cable with density 5N/m is attached to a 3000N wrecking ball. Find the work to raise the wrecking ball from the ground up to the top.

(10) **3.** $\int e^x \cos x \; dx$

(10) **4.** $\int \sin^6(x) \cos^3(x) \; dx$

(10) **5.** Determine the centroid $(\overline{x}, \overline{y})$ of the region from $x = 0$ to $x = \frac{\pi}{2}$ bounded by $y = 2\sin(2x)$, $y = 0$, and $x = 0$.

(10) **6.** $\displaystyle\int \frac{dx}{\sqrt{6+x^2}}$

(10) **7.** $\frac{d}{d\theta} e^{\cosh(1+\theta^3)}$

(10) **8.** $\displaystyle\int \frac{x^2 - 3x + 4}{x^3 - x}\, dx$

(10) **9.** Evaluate the integral using proper limit notation.

$$\int_{-2}^{3} \frac{1}{x^3}\, dx$$