NAME _____ Rec. Instructor: _____

Signature _____ Rec. Time _____

CALCULUS II - EXAM 2
March 5, 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
1a		8	5		8
1b		12	6a		8
2a		6	6b		10
2b		6	7		10
3		6	8		10
4a		8			
4b		8	Total Score		100

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

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

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

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

Work = Force $\times$ Distance; Units of work: ft-lbs, newton-meters = joules;

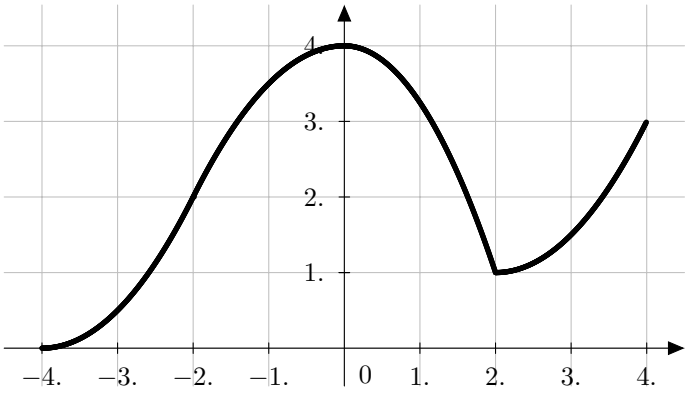
Hooke's Law for springs: $F = kx$, where x is the distance stretched from rest position.

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

1. Evaluate the following integrals.

(8) a) $\displaystyle\int \frac{3x^2 + 2x + 13}{x^2 + 4}\, dx$

(12) b) $\displaystyle\int \frac{2x^2 - 5x - 1}{x^3 - x}\, dx$



2. For the function $y = f(x)$ graphed above, approximate the definite integral $\int_{-4}^{4} f(x)\,dx$ using

(6) a) The Trapezoidal rule for T_4

(6) b) Simpson's rule for S_4

(6) **3.** Give the partial fraction expansion of the rational function using coefficients $A, B, C, \ldots$, but **do not** solve for the values of the coefficients.

$$f(x) = \frac{2x^4 - 5x + 3}{(x^2 + 2x + 1)(x^2 + x + 1)^2}$$

4. Evaluate the integrals using proper limit notation.

(8) a. $\displaystyle\int_0^\infty xe^{-x}\,dx$

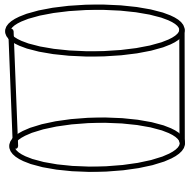
(8) b. $\displaystyle\int_2^6 \frac{1}{\sqrt{6-x}}\,dx$

(8) **5.** A spring requires a force of 2 newtons to stretch it 1 meter beyond its rest length. How much work is required to stretch the spring from 1 meter to 3 meters beyond its rest length.

(8) **6.** a) Find the arc length of the curve $y = x^3$, $0 \leq x \leq 1$. Just set up the integral. **Do not evaluate.**

(10) b) Find the surface area of the surface generated by rotating the curve in part a) around the x-axis. **Evaluate the integral.**

(10) **7.** A cylindrical tank of radius 5 ft and height 10 ft is filled with water of density ρ lb/ft^3. How much work is required to pump all of the water out of the top of the tank? Set up and evaluate an appropriate integral.



(10) **8.** Find the centroid $(\overline{x}, \overline{y})$ of the region bounded by the semicircle $y = \sqrt{9 - x^2}$, $-3 \leq x \leq 3$ and the x-axis. (You may use symmetry and the area formula for a circle.)