NAME _____ Rec. Instructor: _____

Signature _____ Rec. Time _____

CALCULUS II - EXAM 1
February 4, 2020

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		10	4a		10
1b		10	4b		10
2a		10	5		10
2b		10	6		10
3a		10			
3b		10	Total Score		100

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

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

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

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

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

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

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

1. Evaluate the following integrals.

(10) a) $\displaystyle\int \frac{\sin(\sqrt{x})}{\sqrt{x}}\,dx$

(10) b) $\displaystyle\int \frac{x}{\sqrt{x+1}}\,dx$

2. Evaluate the following integrals.

(10) a) $\int \sin^{-1} x \, dx,$ where $\sin^{-1} x$ is the inverse sine function.

(10) b) $\int x^7 \ln(x) \, dx,$

3. Evaluate the following integrals.

(10) a) $\displaystyle\int_0^{\pi/4} \sin(4x)\sin(2x)\,dx.$ Express your final answer as a reduced fraction $\frac{a}{b}$, with no trig functions.

(10) b) $\displaystyle\int \frac{dx}{\sqrt{4+x^2}}$

4. Evaluate the following integrals.

(10) a) $\int \sin^4(x)\cos^7(x)\,dx$

(10) b) $\int \sec^4(x)\,dx$

(10) **5.** An object moves along a straight line with velocity function $v(t) = t \sin t$, in meters per second. Determine its change in position over the time interval $t = 0$ to $t = \pi$ seconds. (Evaluate any trig function in your answer.)

(10) **6.** Find a function $f(t)$ such that $f'(t) = \dfrac{\ln t}{t} - \cos(2\pi t)$.