Math 162: Calculus IIA

First Midterm Exam

February 26, 2019

NAME (please print legibly): _____

Your University ID Number: _____

Your University email _____

Indicate your instructor with a check in the box:

|		
Saul Lubkin	MW 9:00 - 10:15 AM	
Doug Ravenel	MWF 10:25 - 11:40 AM	
Rufei Ren	MW 2:00 - 3:15 PM	
Martin Snow	MW 3:25 - 4:40 PM	
Amanda Tucker	TR 9:40-10:55 AM	

Pledge of Honesty

I affirm that I will not give or receive any unauthorized help on this exam and that all work will be my own.

Signature: _____

- **The presence of calculators, cell phones, iPods and other electronic devices at this exam is strictly forbidden. IF YOU HAVE YOUR PHONE WITH YOU, YOU MUST TURN IT IN TO A PROCTOR BEFORE START- ING THE EXAM. FAILURE TO DO SO WILL BE TREATED AS AN ACADEMIC HONESTY VIOLATION.**

- **Show your work and justify your answers. You may not receive full credit for a correct answer if insufficient work is shown or insufficient justification is given.**

- **Put your answers in the space provided at the bottom of each page or half page.**

- **You are responsible for checking that this exam has all 10 pages.**

1. (20 points) Find the average value of the function $f(x) = \sin^2(x)\cos^2(x)$ on the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$.
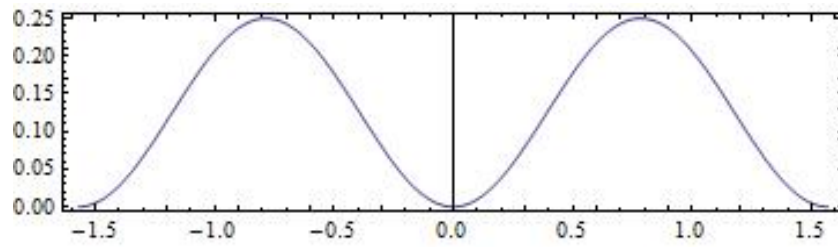
ANSWER:

2. (20 points) If $a \neq 0$, evaluate

$$\int \cos^3(ax + b)\, dx$$

in terms of a and b.

ANSWER:

3. (20 points) A heavy rope, 20 m long, weighs 2 kg/m and hangs over the edge of a building 100 m high. Consider that one ties a heavy ball at the end of this rope with weight 20 kg. How much work is done in pulling half the rope to the top of the building?

ANSWER:

4. (20 points)

(a) (10 points)   Use integration by parts to find a formula for

$$\int x^n e^x \, dx \qquad \text{in terms of} \qquad \int x^{n-1} e^x \, dx$$
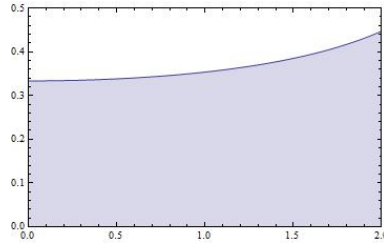
ANSWER:

(b) (10 points)　Use this formula to find

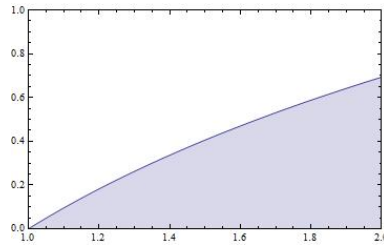$$\int x^3 e^x \, dx.$$

ANSWER:

5. (20 points)

(a) (10 points)   Find the volume of the solid obtained by rotating the region bounded by the x-axis and the curve $y = 1/\sqrt{9 - x^2}$ for $0 \leq x \leq 2$

about the y-axis.

ANSWER:

(b) (10 points)　Find the volume of the solid obtained by rotating the region bounded by the x-axis and the curve $y = ln(x)$ for $1 \leq x \leq 2$ about the line $x = -1$.

ANSWER:

Scratch paper

Scratch paper