Test 1 - MTH 1420
Dr. Adam Graham-Squire, Spring 2020

Name: _____

I pledge that I have neither given nor received any unauthorized assistance on this exam.

_____
(signature)

DIRECTIONS

1. Don't panic.

2. Show all of your work and use correct notation. A correct answer with insufficient work or incorrect notation will lose points.

3. Clearly indicate your answer by putting a box around it.

4. Calculators and/or Maple <u>are</u> allowed on the last 3 questions of the test, however you should still show all of your work. No calculators (other than a basic 4-function) are allowed on the first 6 questions of the test. You should finish the No Calculator/Maple portion first, and when you are done with it, turn it in to me and then you can open up your computer/calculator to finish the last 3 questions, if you need it.

5. Give all answers in exact form, not decimal form (that is, put π instead of 3.1415, $\sqrt{2}$ instead of 1.414, etc) unless otherwise stated.

6. Make sure you sign the pledge.

7. Number of questions = 8. Total Points = 40.

1. (5 points) Calculate $\displaystyle\int_{3}^{4} \frac{1}{(3x-7)^2}\, dx$

2. (5 points) Calculate $\displaystyle\int_1^e \frac{(2 + 3\sqrt{x})}{x\sqrt{x}}\,dx$

3. (5 points) Calculate $\displaystyle\int x^2 e^x \, dx$

4. (5 points) Calculate $\displaystyle\int x \sec^2(x^2) \tan(x^2)\, dx$

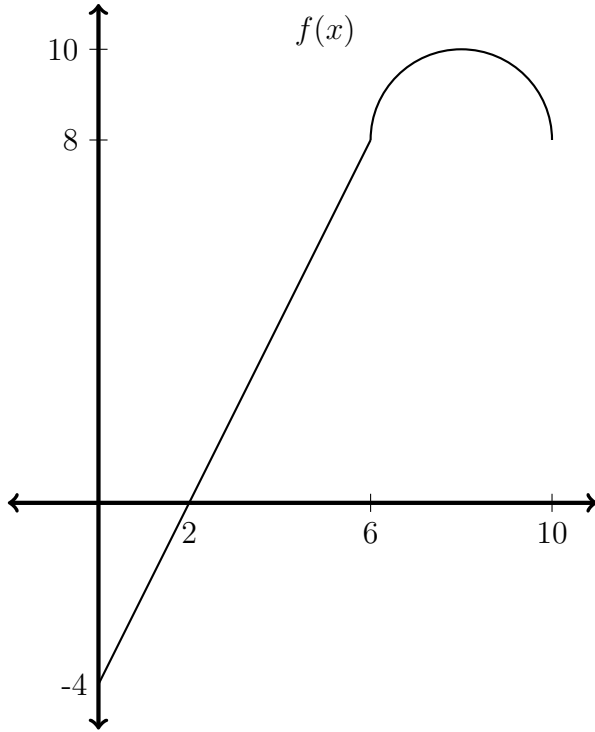5. (5 points) (a) Calculate $\int \left(7 + e^x + \dfrac{1}{1+x^2}\right) dx$

(b) Calculate $\dfrac{d}{dx}\left(\displaystyle\int_1^{\cos(x)} \left[e^{(t^2)} + \ln(4 + \sqrt{t})\right] dt\right)$

Give a brief explanation of how you got your answer, if you don't show much work.

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6. (5 points) Use geometry to calculate $\int_0^{10} f(x)\,dx$, where $f(x)$ is the function with the graph given below:

7. (5 points) Suppose you had to calculate

$$\int \frac{3x^3 \sec^2(x^3)}{5 + \tan(x^3)}\, dx$$

by hand. What approach (integration by parts, u-substitution, etc) would you take to solving it? For this problem, I do NOT want you to get an answer. I want you to

(a) Explain (in words) *how* you would go about solving it

(b) Show the first few steps of your method (with calculation)

(c) State whether you think your approach will work or not, and why.

8. (5 points) (a) Explain, in your own words, what the Fundamental Theorem of Calculus (FTC) says.

(b) Explain why the FTC is so important for calculating the area under a curve. In particular, you should mention *other* ways to calculate/approximate the area under a curve, and what about the FTC is so much easier than other methods.

Extra Credit(1 point) If $\int_1^4 f(x)\,dx = 3$, $\int_1^{13} g(x)\,dx = 6$, and $\int_4^{13} g(x)\,dx = 10$, calculate the value of the expression below (or explain why it cannot be done):

$$\int_4^1 (5f(x) + 2g(x))\,dx$$