

SIMON FRASER UNIVERSITY

MATH 155 Midterm 1

3 February 2010, 08:30–09:20

Last Name _____

Given Name(s) _____

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Circle section number: D100 D400

Signature _____

INSTRUCTIONS

1. **Do not open this booklet until told to do so.**
2. Fill out the box in the upper right corner of this page.
3. This exam has 6 questions on 5 pages. Check to make sure that your exam is complete.
4. No book, paper or device other than usual writing instruments, this examination booklet, and a scientific calculator are allowed. **Calculators with graphing and/or symbolic computation capabilities are not allowed.**
5. **During the examination, speaking to, communicating with, or exposing written papers to the view of other examinees is forbidden.**
6. You may use the **reverse side of the previous page** for rough work or if you run out of space.
7. **You may lose marks if your explanations are incomplete or poorly presented.**
8. **Stop writing when you are instructed to do so. Failure to follow instructions may result in penalties.**

Question	Maximum	Score
1	7	
2	4	
3	5	
4	8	
5	8	
6	8	
Total	40	

1. Indicate whether the following statements are true (T) or false (F).
Justifications are not required.

Assume that $f(x)$ is continuous in the intervals of integration.

A statement containing general constants a, b, c and functions f, g is true if and only if it holds for *all admissible choices* that you can make for a, b, c, f, g .

- [1] (a) _____ If $f(x) \geq c$ for all x in $[a, b]$, then $\int_a^b f(x) dx \geq c(b - a)$.
- [1] (b) _____ $\int_a^b (f(x) - g(x)) dx = \int_a^b f(x) dx + \int_b^a g(x) dx$
- [1] (c) _____ $\int_a^b (f(x))^2 dx = \left(\int_a^b f(x) dx \right)^2$
- [1] (d) _____ $\int_a^b f(x) dx = \int_a^c f(x) dx - \int_c^b f(x) dx$
- [1] (e) _____ $\sum_{k=10}^{20} f(k) = \sum_{k=1}^{20} f(k) - \sum_{k=1}^{10} f(k)$
- [1] (f) _____ $\int_{-a}^a 3 \sin x dx = 0$
- [1] (g) _____ There is a point d in $[a, b]$ such that $f(d) = \int_a^b f(x) dx$.

- [4] 2. Determine the average value of $f(x) = 4x^3 + 5$ in the interval $[1, 4]$.
- [5] 3. Graph the finite region that is enclosed by the curves $y = \sqrt{x}$, $y = -\frac{x}{2}$ and $y = x - 2$. Express the area of this region as the sum of two definite integrals. **DO NOT EVALUATE THE INTEGRALS.**

- [4] 4. (a) Express the sphere of radius r as a solid of revolution. (This involves specifying a certain function and an interval on the x -axis.)

- [4] (b) Use the formula for the volume of a solid of revolution to evaluate the volume of the sphere of radius r .

[8] 5. Find $\int \frac{(\sin x)^3}{\cos x} dx$.

Hint: Split the numerator into two factors, and use $(\sin x)^2 + (\cos x)^2 = 1$.

[8] 6. Evaluate $\int_3^4 \frac{5}{x\sqrt{\ln(3x)}} dx$.