Calculus II (Fall 2015)
Practice Problems for Exam 1

Note: Section divisions and instructions below are the same as they will be on the exam, so you will have a better idea of what to expect, though I will leave spaces for answers on the actual exam. However, this is not quite a mock exam as there are more practice problems here than there will be on the actual exam. Nevertheless, I recommend you treat it as a mock exam (prepare first and try to finish on your own), with a rough goal of finishing in 2–2.5 hours. Then check your solutions with those posted on D2L, ask questions if needed, and go back and make sure you can do the problems on your own.

Instructions: Write your name and discussion section number (11–16) at the top. Read all instructions.

No notes, text, calculators, etc. are allowed. Please answer the questions in the space provided below. You may use the back of the pages as scratch paper. If you run out of space for your answer on the front, you may continue it on the back provided you note that your answer continues on the back. Each section has additional instructions below. Maximum score: 0 points.

1 True or False

Instructions: Circle T or F for each question. No work is needed. Each problem is worth 0 points. In this section, a and b are real numbers with $a \leq b$, $f(x)$ and $g(x)$ denote a continuous functions on $\mathbb{R}$, and R is the region between $y = f(x)$ and $y = g(x)$ from $x = a$ to $x = b$.

1. T F If $F(x)$ is an antiderivative of $f(x)$, then $\int_a^b f(x)\,dx = F(b) - F(a)$.
2. T F Any continuous function on $[a, b]$ is differentiable.
3. T F Any continuous function on $[a, b]$ is integrable.
4. T F If a function is not continuous at some point in $[a, b]$, then it is not integrable on $[a, b]$.
5. T F $\int (f(x) + g(x))\,dx = \int f(x)dx + \int g(x)\,dx$
6. T F $\int (f(x)g(x))\,dx = \int f(x)dx \cdot \int g(x)\,dx$
7. T F $\frac{d}{dx} \int_a^b \sin(x^4)\,dx = \sin(x^4)$
8. T F $\int_{-\pi}^{\pi} x \cos x\,dx = 2\int_0^{\pi} x \cos x\,dx$.
9. T F The area of R (as above) is $\int_a^b (f(x) - g(x))\,dx$.
10. T F If S is the solid obtained by rotating R around the x-axis, the volume of S is $\int_a^b \pi(f(x)^2 - g(x)^2)\,dx$.
11. T F If S is the solid obtained by rotating R around the line $x = a$, the volume of S is $\int_a^b 2\pi(x - a)(f(x) - g(x))\,dx$.

2 Quick questions

Instructions: For each question in this section, you are not required to show any work. However, in the event that your answer is incorrect, you may receive partial credit for work you write down. Each problem is worth 0 points. **Box in your final answer.**

12. Compute $\int_0^3 (x^2+1)\,dx$.

13. Compute $\int_0^{\pi/9} \sin 3x\,dx$.

14. Compute $\int x^2\cos(x^3)\,dx$.

15. Compute $\int (2\sqrt{x}+1)^5\,dx$.

16. Compute $\int \sec^2 x \tan x\,dx$.

17. Compute $\int \frac{\cos x}{\sin^2 x}\,dx$.

18. Compute the area under $y=x^2-5$ from $x=0$ to $x=2$.

19. Approximate the area under $y=\sqrt{x}$ between $x=0$ and $x=1$ by computing the corresponding Riemann sum with $n=4$ equal width partitions using the right endpoint rule.

3 Patient Problems

Instructions: For each problem below, show your work. Each problem is worth 0 points. You may use the following identities: $1+2+\cdots+n^2=\frac{n(n+1)}{2}$ and $1^2+2^2+\cdots+n^2=\frac{n(n+1)(2n+1)}{6}$. **For calculations, box in your final answer**.

20. Using Riemann sums and the definition of integrals, compute the area under the curve $y=x^2$ from $x=0$ to $x=2$.

21. Sketch the region bounded by the curves $y=2x^2-7$ and $y=5-x^2$, and compute the area.

22. Sketch the region bounded by the curves $y=\sqrt{x}$, $y=2-x$ and the x-axis. Compute its area.

23. Let R be the region in the xy-plane under the curve $y=\sqrt{x}$ between $x=0$ and $x=1$, and let S be the solid obtained by rotating R about the line $x=-2$. Sketch R and S, and determine the volume of S.

24. Let R be the region in the xy-plane above the x-axis which is bounded by $y=x$ and $y=x^3$. Let S be the solid obtained by rotating R about the y-axis. Sketch R and S, and determine the volume of S.

25. Suppose the Oscar Mayer Wienermobile, initially at rest at time 0, travels due north and accelerates at a rate of $\frac{3t}{2}$ mph/s at time t (measured in seconds). What is the average speed of the Wienermobile from time $t=0$ to $t=10$?