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Math 2020, Fall 2016, Test 2
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Write clearly, label the problems and your answers, and leave space between problems. You may keep this list of questions.

1. Estimate $\ln 5 = \int_1^5 \frac{1}{x}\,dx$ using
   (a) the trapezoidal rule and $n = 2$ panels,
   (b) the midpint rule and $n = 2$ panels, and
   (c) Simpson's rule, based on these two estimates.

   (For reference, the true value is $1.6094379\ldots$.)
2. (a) Briefly explain the difference between an integral and an antiderivative.
   (b) Explain how integrals give antiderivatives (a simple formula will suffice).
   (c) Explain how antiderivatives can be used to evaluate integrals. (Again, a simple formula will suffice.)
3. Expand $\dfrac{2x-3}{(x-3)(x^2+4x+9)}$ in partial fractions.
4. Compute $\displaystyle\int \frac{dx}{2x^2-5x}$
5. Compute $\displaystyle\int \sin^2(\theta)\cos^3(\theta)\,d\theta$
6. Compute $\displaystyle\int \frac{dx}{\sqrt{4-x^2}}$
7. Compute $\displaystyle\int (3x+1)e^{3x}\,dx$
8. Compute $\displaystyle\int x^{99}\ln x\,dx$
9. Compute $\displaystyle\int \frac{dx}{x+2\sqrt{x}+1}$
10. Compute $\displaystyle\int \frac{dx}{\sqrt{x^2-9}}$

——— The End of the Questions ———
——— Some integral and other formulas are on the reverse ———

- $\int x^n \, dx = \frac{1}{n+1} x^{n+1} + C$ if $n \neq -1$
- $\int \frac{1}{x} \, dx = \ln x + C$
- $\int e^x \, dx = e^x + C$
- $\int \sin x \, dx = -\cos x + C$
- $\int \cos x \, dx = \sin x + C$
- $\int \tan x \, dx = -\ln |\cos x| + C$
- $\int \cot x \, dx = \ln |\sin x| + C$
- $\int \sec x \, dx = \ln |\sec x + \tan x| + C$
- $\int \csc x \, dx = -\ln |\csc x + \cot x| + C$
- $\int \frac{f'(x)}{f(x)} \, dx = \ln |f(x)| + C$
- $\int \frac{1}{x^2 + 1} \, dx = \tan^{-1} x + C$
- $\int \frac{1}{\sqrt{1 - x^2}} \, dx = \sin^{-1} x + C$
- $\sin^2 x + \cos^2 x = 1$
- $\tan^2 x + 1 = \sec^2 x$
- $\int u \, dv = uv - \int v \, du$