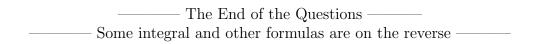
## R. Bruner Math 2020, Fall 2016, Test 2 October 7, 2016

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....)

- 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  $\frac{2x-3}{(x-3)(x^2+4x+9)}$  in partial fractions.
- 4. Compute  $\int \frac{dx}{2x^2 5x}$
- 5. Compute  $\int \sin^2(\theta) \cos^3(\theta) d\theta$
- 6. Compute  $\int \frac{dx}{\sqrt{4-x^2}}$
- 7. Compute  $\int (3x+1)e^{3x} dx$
- 8. Compute  $\int x^{99} \ln x \, dx$
- 9. Compute  $\int \frac{dx}{x + 2\sqrt{x} + 1}$
- 10. Compute  $\int \frac{dx}{\sqrt{x^2 9}}$



• 
$$\int x^n dx = \frac{1}{n+1}x^{n+1} + C \text{ if } n \neq -1$$

$$\bullet \int \frac{1}{x} dx = \ln x + C$$

$$\bullet \int \sin x \, dx = -\cos x + C$$

$$\bullet \int \tan x \, dx = -\ln|\cos x| + C$$

• 
$$\int \sec x \, dx = \ln|\sec x + \tan x| + C$$

• 
$$\int \frac{f'(x)}{f(x)} dx = \ln|f(x)| + C$$

$$\bullet \int \frac{1}{x^2 + 1} dx = \tan^{-1} x + C$$

$$\bullet \int \frac{1}{\sqrt{1-x^2}} \, dx = \sin^{-1} x + C$$

$$\bullet \sin^2 x + \cos^2 x = 1$$

$$\bullet \ \tan^2 x + 1 = \sec^2 x$$

$$\bullet \int u \, dv = uv - \int v \, du$$