

Show all your work.

Name: _____

1. (10 points) Find the most general antiderivative of the function

$$f(x) = \frac{1 + 3x}{\sqrt{x}}.$$

2. (15 points) Approximate the integral

$$\int_0^2 x^3 dx$$

using the Midpoint rule (i.e., the Riemann sum $\sum_{i=1}^n f(x_i^*)\Delta x_i$ where each x_i^* is the midpoint of its subinterval). Use two subintervals (i.e., $n = 2$).

3. (20 points) Given functions f and g , use the facts that $\int_0^4 f(x)dx = 4$, $\int_4^6 f(x)dx = 3$, $\int_0^6 g(x)dx = -5$, and $\int_2^6 g(x)dx = -4$ to evaluate the following integrals:

- (a) $\int_0^4 (2 \cdot f(x) + 1)dx$
- (b) $\int_0^6 f(x)dx$
- (c) $\int_0^6 [f(x) - 4 \cdot g(x)] dx$
- (d) $\int_0^2 g(x)dx$.

4. (15 points) Evaluate the following integrals:

- (a) $\int_1^7 \frac{1}{\sqrt[3]{t}} dt$
- (b) $\int e^x + \frac{5}{\sqrt[3]{x^2}} dx$

5. (10 points) Compute

$$\frac{d}{dx} \int_x^4 \sin(t^3) dt.$$

6. (15 points) Using some kind of substitution, find the value of the following integral:

$$\int_e^{e^4} \frac{1}{x\sqrt{\ln x}} dx.$$

7. (15 points) Using integration by parts, find the value of

$$\int_0^{\pi} x \cos(x) dx.$$