

Calculus 1 — Exam 6
MAT 250, Spring 2013 — D. Ivanšić

Name: _____
Show all your work!

Find the following antiderivatives.

1. (3pts) $\int \frac{1}{\sqrt{x}} dx =$

2. (3pts) $\int \frac{1}{\sqrt{1-x^2}} dx =$

3. (4pts) $\int \sec(4\theta) \tan(4\theta) d\theta =$

4. (7pts) $\int t^2(t - \sqrt[4]{t}) dt =$

5. (8pts) Find $f(x)$ if $f'(x) = x^{\frac{2}{3}} + \frac{7}{x}$ and $f(1) = 6$.

6. (6pts) Write using sigma notation:

$$\frac{1}{1} + \frac{1}{\sqrt{3}} + \frac{1}{\sqrt{5}} + \cdots + \frac{1}{\sqrt{101}} =$$

7. (16pts) Find $\int_{-1}^6 x - 3 dx$ in two ways (they'd better give you the same answer!):
- Using the “area” interpretation of the integral. Draw a picture.
 - Using the Evaluation Theorem.

8. (16pts) The function $f(x) = 4 - x^2$, $0 \leq x \leq 2$ is given.
- Write down the expression R_4 that estimates the area under this curve using four approximating rectangles and right endpoints. Then evaluate the expression.
 - Illustrate with a diagram, where appropriate rectangles are clearly visible. What does R_4 represent? Does it over- or underestimate the area under the curve?

Use the substitution rule in the following integrals:

9. (9pts) $\int (x - 4) \cos(x^2 - 8x + 4) dx =$

10. (10pts) $\int_0^1 \frac{e^x + 1}{(e^x + x)^2} dx =$

11. (10pts) The rate at which a deer population is growing is $2 + \frac{t}{4}$ deer per day.
- Use the Net Change Theorem to find how much the population has grown in 8 days.
 - If there were initially 107 deer, how many were there after 8 days?

12. (8pts) Show that $2 \leq \int_{-1}^1 e^{x^2} dx \leq 2e$ **without** evaluating the integral.

Bonus. (10pts) A car is traveling at velocity 3 meters per second when it starts accelerating at constant acceleration. If it has traveled 108 meters during the 6 seconds that it accelerated, what is its acceleration?