

18.01 SPRING 2007
PRACTICE EXAM FOR MIDTERM 2

Answer as many questions as you can. Write your solutions in the test booklet, showing enough work to demonstrate how you arrived at the answers. You're encouraged to use scrap paper, but only the answers in your test booklet will be graded. Calculators are not permitted.

Please circle or box your answers for emphasis: e.g. *the derivative of x^2 is $\boxed{2x}$.*

1. [10 pts] Compute the area enclosed by the curves $y = x$, $y = 2x$, $y = 1/x$, and $y = 2/x$.

2. [20 pts] Compute each integral:

(a) $\int \frac{dx}{x^2 + 2x + 12}$

(b) $\int \frac{10 - 2x}{x^2 + 5x}$

3. (a) [10 pts] Compute $\int \sin^3 x dx$.

(b) [20 pts] Compute $\int \frac{x^2 dx}{\sqrt{4 - x^2}}$. For full credit, you should write an answer that doesn't involve any trigonometric functions.

4. [20 pts] Let R be the region bounded by the y -axis, the graph of $y = 2 - x$, and $y = x^2$. Compute the volume of the body obtained by rotating R around the y -axis.

5. [20 pts] Find the unique function $x(t)$ that satisfies the differential equation

$$\frac{dx}{dt} = \sqrt{(t-1)(x-4)}$$

and the initial condition $x(5) = 8$.