

Math 152, Fall 2007, Review Problems for Midterm #1

Your first exam is likely to have problems that do not resemble these review problems.

1. Find the following indefinite integrals.

a) $\int (x^2 + 2)e^{3x} dx$ b) $\int x^2 \arctan x dx$ c) $\int \cos^5 2x \sin^4 2x dx$
d) $\int \frac{x^2 - x + 3}{(x+1)(x^2+4)} dx$ e) $\int \frac{dx}{x\sqrt{16-x^2}}$ f) $\int \sin 5x \cos 7x dx$

2. The region R is bounded by the curves $y = 2x$, $y = \sqrt{8 + 2x^2}$ and the y -axis. Find the volume of the solid obtained by rotating R : (a) about the x -axis; (b) about the y -axis.

3. The region R is bounded by the graph of $y = \cos x$, $\frac{\pi}{2} \leq x \leq \frac{3\pi}{2}$ and the x -axis. Find the volume of the solid obtained by rotating R about the y -axis.

4. Consider the curve $y = e^{-x/2}$, $0 \leq x \leq 1$. Set up integrals representing the length of this curve

5. A 200-lb package is to be hoisted from the ground to the top of a 50-ft wall by a chain weighing 3 lb/ft. How much work will this require?

6. Determine whether each of the following integrals is convergent or divergent. Evaluate those that are convergent. Be sure to show your work and explain your reasoning.

a) $\int_e^\infty \frac{1}{x(\ln x)^2} dx$ b) $\int_2^\infty \frac{x^9 + 2}{x^{10} - x} dx$
c) $\int_2^4 \frac{1}{\sqrt{x-2}} dx$ d) $\int_0^{\pi/4} \frac{1}{(x^2 + 1) \arctan x} dx$

7. Find the average value A of $\tan^2 x$ on the interval $0 \leq x \leq \pi/4$. With a picture, explain the connection between the line $y = A$ and the graph $y = \tan^2 x$.