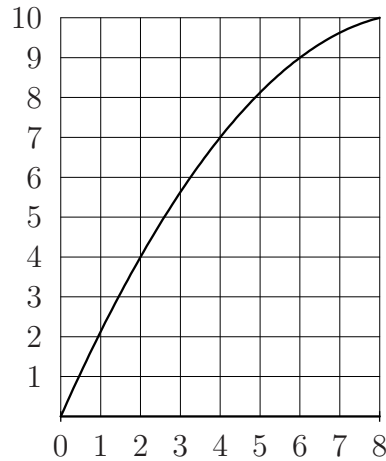


Math 132: Calculus for the Physical & Life Sciences 2
 Spring 2006
 Practice Questions for Midterm 2

1. The graph of the function $f(x)$ is shown below.



- (a) Use the graph of f to compute the following approximations of $\int_0^8 f(x) dx$.

$LEFT(2)$: _____

$RIGHT(2)$: _____

$MID(2)$: _____

$TRAP(2)$: _____

$SIMP(2)$: _____

- (b) [6 points] For each method, decide whether the approximation of $\int_0^8 f(x) dx$ is an *overestimate*, an *underestimate*, or that this *cannot be determined* from the given information. In the case of an overestimate or underestimate, briefly explain your reasoning.

Method	Type of Estimate	Reason
$LEFT$		
$RIGHT$		
MID		
$TRAP$		
$SIMP$		

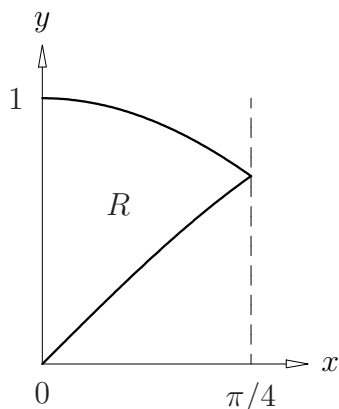
2. (a) Set up an integral that represents the arclength of the portion of the graph of $y = \sin(x)$ between $x = 0$ and $x = \pi$. **Do not compute the integral.**
- (b) Approximate the integral in part (a) using a left hand sum with $n = 4$ subintervals.
3. Rewrite each of the following improper integrals as a limit, or limits. State whether the integral converges or diverges, and compute its value if it converges.

- (a) $\int_{-1}^2 \frac{1}{x^3} dx$
- (b) $\int_0^2 \frac{1}{\sqrt{4-x^2}} dx$
- (c) $\int_0^\infty e^{-4x} dx$

4. Use the comparison test to determine if each of the following improper integrals converges or diverges. You do not need to compute the value of the integral.

- (a) $\int_1^\infty \frac{x^4}{x^5+1} dx$
- (b) $\int_1^\infty \frac{\cos(x)}{\sqrt{x^3+5}} dx$

5. Let R denote the region bounded by $y = \sin x$, $y = \cos x$, $x = 0$ and $x = \pi/4$.



- (a) Find the area of R .
- (b) Find the volume of the solid obtained by revolving R about the x -axis.
6. Consider the curve described in polar coordinates by the equation $r = \sin(3\theta)$.
- (a) Sketch the curve.
- (b) Find the area of the region enclosed by one loop of the curve.
- (c) Write the equation of the curve in Cartesian coordinates. Hint: Multiply the equation of the curve by r^3 and use the identity $\sin(3\theta) = 3 \sin \theta \cos^2 \theta - \sin^3 \theta$.
7. Suppose a metal rod of length 2 meters has a mass density $\delta(x) = 5 + 1.2x^2$ kg per meter.
- (a) Find the total mass of the rod.
- (b) Find the center of mass of the rod.
8. The distribution of length in a certain population of inchworms is described by the pdf $p(x) = c(3x^2 - x^3)$ for $0 \leq x \leq 3$.
- (a) Find the value of the constant c .
- (b) Find the proportion of inchworms with length at most 2 cm.

9. Suppose

$$p(x) = \frac{4}{\pi} \cdot \frac{1}{1+x^2}$$

is the probability density function for the quantity x , for $0 \leq x \leq 1$.

- (a) Find the mean of x .
- (b) Find the median of x .