

Math 132 Midterm #1

Feb 27, 2003

Your name _____

ID number _____

Your section _____

Note:

- You may use a calculator, but no books or notes.
- It is **not sufficient** to simply write down the answers. You must **explain how** you arrive at your answers.
- When evaluating integrals you **MUST** provide all algebraic steps; numerical answer along will **NOT** earn you full credit.
- You have **90 MINUTES**.

| | FOR GRADERS' USE ONLY | | |
|-------|-----------------------|-----|-----|
| #1 | (a) | (b) | (c) |
| #2 | | | |
| #3 | (a) | (b) | |
| #4 | (a) | (b) | |
| #5 | (a) | (b) | |
| #6 | (a) | (b) | (c) |
| Total | | | |

1. Evaluate the following integrals **algebraically**:

[10 points] (a) $\int_0^{\frac{\pi}{4}} \tan x dx$

[10 points] (b) $\int x e^{-x^2} dx$

[10 points] (c) $\int_{-3}^3 \sqrt{9-x^2} dx$ (Hint: draw a picture!)

2. [10 points] Given that

$$\int_0^3 f(x)dx = 4, \quad \int_3^6 f(x)dx = 4, \quad \int_2^6 f(x)dx = 5,$$

find

$$\int_0^2 (2f(t) - 3)dt.$$

NOTE: show your steps!

3. A particle moves along a straight line with velocity

$$v(t) = 2t\sqrt{1 + 2t^2}.$$

[10 points] (a) Determine the total displacement of the particle from $t = -2$ to $t = 2$.

[10 points] (b) Determine the total distance traveled from $t = -2$ to $t = 2$.

4. Consider the the region bounded by the curve $x = 1 - y^4$ and $x = 0$.
[10 points] (a) Set up the integral for the area of this region. Do NOT evaluate the integral.

[10 points] (b) Set up the integral for the volume of the solid obtained by rotating this region about the ***y*-axis**. Do NOT evaluate the integral.

5. On February 27, 2003 the outside temperature was rising at a rate of \sqrt{t} degrees per hour from midnight to 12 noon.

(a) [5 points] Denote by $T(t)$ the temperature t hours past midnight. Compute $T(t) - T(0)$.

(b) [5 points] It was observed that the temperature at 9 a.m. was three times the temperature at 1 a.m. What is the temperature at 1 a.m.?

6. [10 points] Define a function $g(x)$ by

$$g(x) = \int_{-1}^x f(t) dt,$$

where the graph of $f(x)$ is shown on the right.

- (1) [3 points] Sketch the graph of g from $x = -1$ to $x = 4$.
- (2) [4 points] Determine on which interval g is increasing and decreasing. Explain your reasoning.
- (3) [4 points] Determine the location of the local extrema of g . Explain your reasoning.