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MATH 152 Dr. Z. , Practice for Make-Up Exam I, Practice A6,

1. (10 points [5 each]) Find the following indefinite integrals

(a)

$$\int x\sqrt{1-x^2} dx$$

(b)

$$\int \frac{1}{(x+2)^2(x+1)} dx$$

2. (10 points) The base of a solid is the region bounded by the curve $x^{20} + y^{20} = 1$. Each cross section of the solid perpendicular to the y -axis is a rectangle whose length is five times its width, with the width at the bottom. Set-up, but do not evaluate, an integral for the volume of the solid?

3. (10 points, 4, 3, and 3 points resp.) Consider the curve $y = \sin^3 x$, $0 \leq x \leq \pi/3$. Set-up, but do not evaluate integrals for (a) its length (b) the area of the surface formed by rotating it about the y -axis (c) the area of the surface formed by rotating it about the x -axis

4. (10 pts) A certain particle is moved by a force $F(x)$ given by $F(x) = 5/x^2$, where x is the distance from the origin. How much work does it take to move it from $x = 1$ to $x = 2$.

5. (10 points, 5 each) Determine whether each of the following integrals is convergent or divergent.

(a)

$$\int_1^{\infty} \frac{x^{10} + \sqrt{x}}{x^{11} + 6\sqrt{x} + 8} dx$$

(b)

$$\int_{10}^{11} \frac{1}{(10-x)^8} dx$$

6. (10 pts) Find the average value, f_{ave} , of $f(x) = x^3 \ln x$ on the interval $0 \leq x \leq e$.

7. (10 pts [6 for (a) and 4 for (b)]) Let

$$I = \int_1^5 f(x) dx$$

where $f(x)$ is a function such that $f(1) = 1, f(2) = 2, f(3) = 3, f(4) = 4, f(5) = 5$. It is also known that the maximum of the second derivate of $f(x)$ in the interval $[1, 5]$ is 2.

- (a) Use the Trapezoid rule with $n = 4$ subdivisions find an approximation.
- (b) Estimate the error.

8. (10 points, 5 each) The region R is bounded by the curves $y = x$ and $y = x^3$, and consider only that part for which $x \geq 0$. Find the volume of the solid obtained by rotating R about about the x -axis.

9. (10 pts) Find the value (or values) of r for which $y = e^{rt}$ satisfies the differential equation

$$y'''' - y = 0 \quad .$$

10. (10 pts) The half-life of Padminium is 20 years. Right now there are 10 pounds. How long ago were there 80 pounds?