MATH 2250 Calculus
Eric Perkerson

Name:

Date: November 22, 2015

Practice Test No. 4

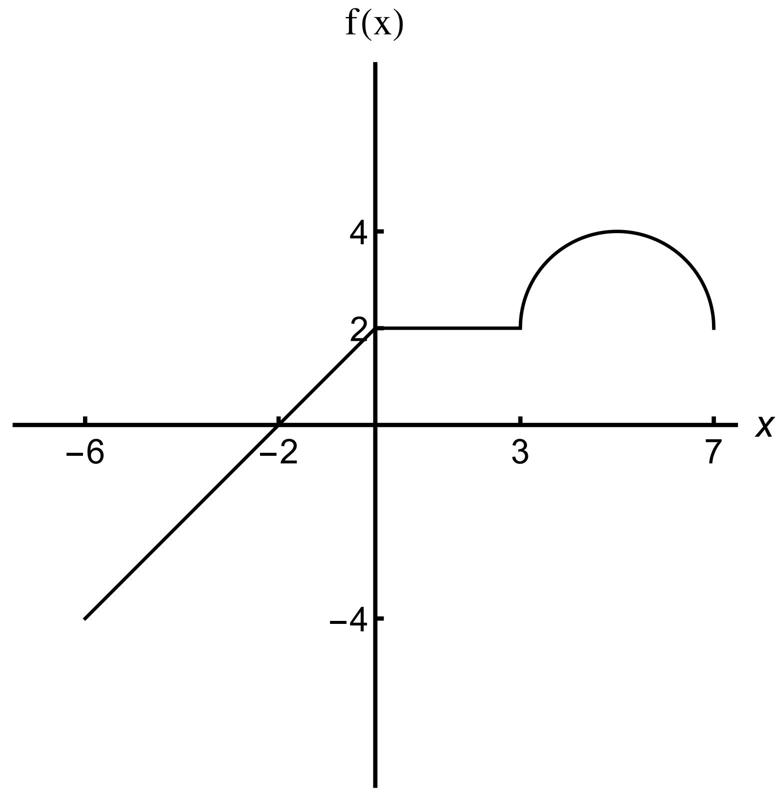
Show all of your work, label your answers clearly, and do not use a calculator.

Problem 1 (15 points) State both parts of the Fundamental Theorem of Calculus:

a Part I

b Part II

Problem 2 (10 points) Find the definite integral $\int_{-6}^{7} f(x)dx$ using the graph of $f(x)$ given below. Show as much work as you can for partial credit. (The portion of the graph that looks like a semicircle is in fact a semicircle).



Problem 3 (25 points) Evaluate the following antiderivatives, definite integrals, and average values.

a $\displaystyle\int -2x^6 + \sqrt{x}\; dx$

b $\displaystyle\int \frac{1}{t} + \sin(t)\; dt$

d $\displaystyle\int_0^1 \sec(t)\tan(t) + 1\; dt$

e Find the average value of $f(x) = \dfrac{3}{x^2} + 1$ on the interval $[2, 4]$.

Problem 5 (15 points) A small ball is stuck on the end of a spring, and the ball is bouncing up and down on the spring. The vertical acceleration function of the ball is $a(t) = \sin(t)$, the velocity at $t = \pi$ is $v(\pi) = 1$, and the position at $t = \pi$ is $s(\pi) = 3$, answer the following questions:

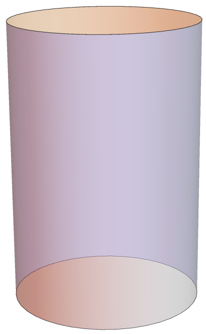
a Find the velocity function $v(t)$ of the particle.

b Find the position function $s(t)$ of the particle.

c What is the ball's change in position between $t = 0$ and $t = \pi$?

d How much distance does the ball travel between $t = 0$ and $t = \pi$?

Problem 6 (15 points) A container in the shape of a right circular cylinder without a top has a surface area 5π ft^2. What height and radius will maximize the volume?



Problem 7 (15 points) For this problem, you will need the formula

$$\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$$

a First use either high school geometry or the Fundamental Theorem of Calculus to compute the definite integral $\int_0^1 3x + 1dx$.

b Using the definition and picking c_k as the right end point of the k^{th} interval, write an expression for the Riemann sum in terms of n, the number of rectangles the interval $[0, 1]$ is divided up into.

c Take the limit of the expression from part b to find the definite integral $\int_0^1 3x + 1dx$ using the definition and picking c_k as the right end point of the k^{th} interval.