Math 152

Show Your Work! February 15, 2011 Name ____________________________

Good Luck! TEST #2 B (please print = 1 point)

1. DEFINE: $\int_a^b f(x)\ dx = \lim\limits_{\to}$

(2)

2. Carefully and completely state **Part 2** of the Fundamental Theorem of Calculus.

(3) If

then

3. In building an integral application, step 1 is __________________ (one word)

(1)

4. Represent the length of the curve y= 1+sin(5x) from x=0 to x=π as a definite integral and then **use your calculator** to evaluate the integral (2 decimal places).

L = $\int$ = _____________ (number)

(7)(2)

5. Represent the length of the ellipse (1 +3sin(t), 2+5cos(t)) 0≤t≤2π as a definite integral.
Do NOT evaluate the integral.

L = $\int$

(7)

6. The shaded region in Fig. 1 is rotated around the x-axis.
Represent the volume of this solid as a definite integral.
Do NOT evaluate the integral.

volume = $\int$

(7)

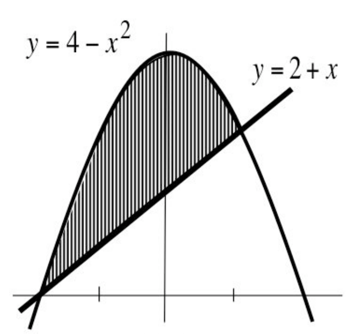


Fig. 1

7. A solid in Fig. 2 consists of circles with bottoms on the x-axis and tops on the curve $f(x) = 1 + x$ for $0 \le x \le 2$. Represent the volume of this solid as a definite integral. Do NOT evaluate.

volume = $\int$

(7)

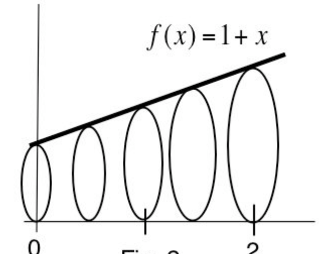


Fig. 2

8. Quickies: Represent each volume as a definite integral:

(a) Fig. 3 volume = $\int$

(2)

(b) Fig. 4 volume = $\int$

(2)

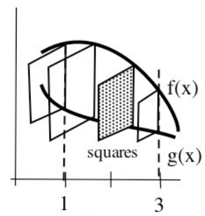


Fig. 3

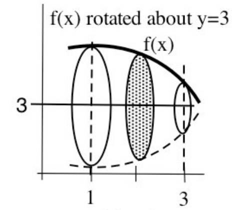


Fig. 4

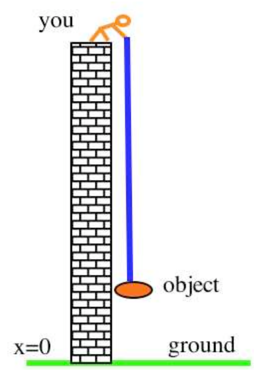
9. You are at the top of a H= 30 foot tall building and are lifting a W=200 pound object using a chain that weighs 0.6 pounds per foot of length. How much work do you do to lift the object from the ground to a height of 20 feet?

(a) work = $\int$

(7)

(b) Use antiderivatives to evaluate the integral in part (a). work = ________

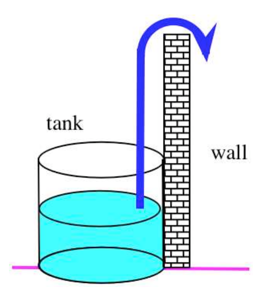
(5)



10. A cylindrical tank has a radius of 2 feet and is 6 feet tall. The tank is full of a liquid that has a density of 55 pounds per cubic foot. How much work is done to lift the top 4 feet of liquid over the top of a 13 foot tall wall? Do not evaluate the integral.

work = $\int$

(7)



11. A spring has a natural length of 9 inches and a 2 pound force stretches it to a length of 15 inches. How much work is done to stretch the spring from a length of 10 inches to 16 inches? Use antiderivatives to evaluate the integral.

work = $\int$ = ______________________ (2 decimal places)

(7)(4)

12. Three quick antiderivatives. (3 points each)

(a) $\int \cos^2(x)\ dx$ = ____________________________

(b) $\int \sec^2(x)(5+\tan(x))^3\ dx$ = ____________________________

(c) $\int \frac{6}{x^2}\ dx$ = ____________________________

13. Three objects are placed on the number line: (1) 4 pounds at x= 6 , 7 pounds at x= 3 , and 5 pounds at x= -4 .

(1) (a) Total weight = _____

(3) (b) Moment about the origin M0 = ______

(3) (c) Center of mass = balance point = ________

(3) (d_ {moment about x=2} = ________

14. Write MAPLE commands (2 points each)

(a) To graph y= x+sin(x) for 1≤x≤5: ____

(b) To evaluate $\int_1^3 \sqrt{1+x}\ dx$: ____

15. Biographies. Name these people – last names are enough. (1 point each)

(a) A-bomb, game theory, quantum mechanics, ... _______________

(b) Worked for person (a) at Institute for Advanced Study, great communicator ____________

(c) Magic! Quit high school and ran away from home _________________

16. **Something NEW**. Do not panic. Think. (Step 1 !!)

A 10 inch long metal bar (Fig. 15) has a radius of 2 inches and has a density at location x of $d(x) = 3+\sin(x)$ pounds per cubic inch. Represent the total weight of the bar as a definite integral. Do NOT evaluate the integral.

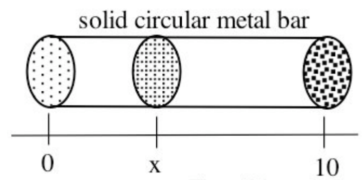


Fig. 15

(5)

weight = $\int$

The end! (total points = 103)