Math 152

Show Your Work! February 17, 2009 Name _____

Good Luck! TEST #2 A (please print)

1. (a) Represent the LENGTH of the curve $f(x) = x+\cos(x)$ for $0 \le x \le 3$ as a definite integral.
(Do NOT evaluate it.)

length = $\int$

(6)

(b) Represent the LENGTH of the curve $x(t) = 1+3t$ $y(t) = \sin(2t)$ for $0 \le x \le \pi$ as a definite integral.
(Do NOT evaluate it.)

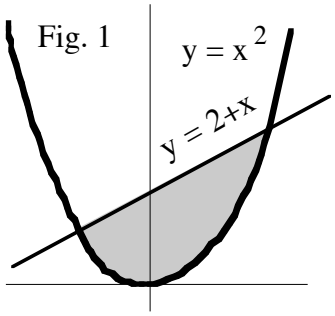
length = $\int$

(6)

2. A solid region is formed when the he shaded area in Fig. 1 is revolved around the x-axis. Represent the **volume** as a definite integral. **(Do NOT evaluate it.)**

volume = $\int$ dx

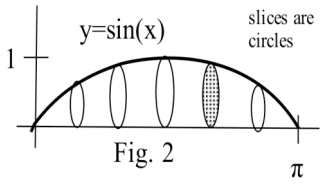
(7)



3. Represent the **volume** of the solid in Fig. 2 as a definite integral. The slices are circles. **(Do NOT evaluate it.)**

volume = $\int$ dx

(7)



4. You are at the top of a H=29 foot tall building (Fig. 4), and are lifting a W=300 pound sofa from the ground to a balcony that is B=20 feet above the ground using a chain that weighs C=3 pounds per foot. How much work do you do?

(a) work = $\int$ dx

(7)

(b) Use antiderivatives to evaluate the integral in part (a). Work = _____

(3)

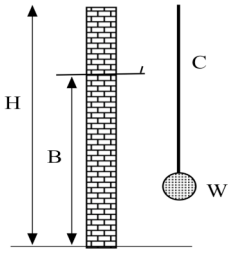


Fig. 4

5. The tank in Fig. 5 has width W=4 feet, height H=6 feet and length L=7 feet.is 5 feet. It is filled with a material that weighs 40 pounds per cubic foot. How much work is done to pump the top 2 feet of material over the top of a 12 foot tall wall?

(Do NOT evaluate it.)

Work = $\int$

(7)

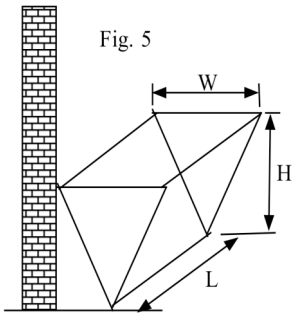


Fig. 5

6. A spring has a natural length of 10 inches (rest length), and a 2 pound weight stretches it to a length of 13 inches. Calculate the work done to stretch the spring from a length of 11 inches to a length of 15 inches. (Show your work.) Work = _____

(7)

7.. A strange object is made of three uniformly dense rectangles (Fig. 7). Determine the coordinates of the center of mass of the object.

$\bar{x}$ = _____ $\bar{y}$ = _____

(4)(4)

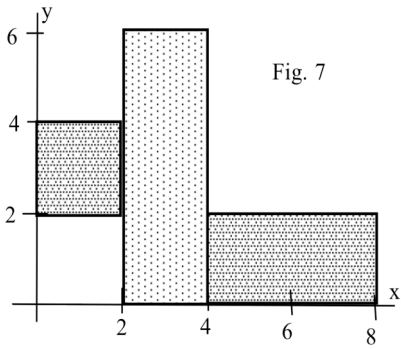
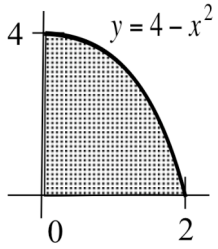


Fig. 7

8. A region is bounded by the curve $y = 4 - x^2$, the x-axis, and the vertical lines x = 0 and x = 2. Determine $\bar{x}$ = _____ (Do not calculate $\bar{y}$)



(7)

9. The units of x are cats, the units of f(x) are dollars per cat, and the units of g(x) are pounds. Then the units of

(a) $\int g(x)\ dx$ are _____(2) (b) $\int \frac{f(x)}{g(x)}\ dx$ are _____ (2)

(c) $\int f^2(x)\ dx$ are _____ (2)

10. (a) $\int \frac{\cos(2x)}{\sin(2x)}\ dx$= _____ (b) $\int \frac{x}{\sqrt{3+x^2}}\ dx$= _____

(4)(4)

11. Something NEW (but not hard.): A 10 foot long piece of flexible chain is in a pile on the ground (Fig. 11). How much work is done to lift one end of the chain so the top end is 10 feet above the ground (and the bottom end is just touching the ground? The chain weighs 4 pounds per foot.

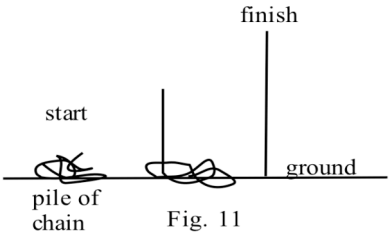


Fig. 11

Work = $\int$ = _____

(6)

12. Determine the volume when the region bounded by the curve $f(x) = \frac{1}{1+x^2}$, the lines x=0, x=2 and the x-axis is rotated around the y-axis. (Hint: one method is much easier than the other. Be smart/efficient.) **Evaluate using antiderivatives and show your work.**

(a) **volume** = $\int$ = _____

(6) (3)

(b) The volume when the same region is rotated around the line x = 3 is: **(Do NOT evaluate it.)**

volume = $\int$

(3)

(c) If the units of x are cm and the units of f(x) are $(L/min)/cm^2$ then the units of the integral in part (a) are _____

(2)

13. Biographies (1 each)

(a) Teaches at UC Berkley, loves "understanding" and "visual" math: _____

(b) Studied soap bubbles, loves rock climbing: _____

(c) What does it mean if your Erdos Number is 1? _____

The end!