

Name \_\_\_\_\_

Period \_\_\_\_\_

Calculus BC – Chapter 6 Sample Test (calculators allowed)

Show all work for free-response questions.

1. Let  $R$  be the region enclosed by the graph of  $y = 1 + \ln(\cos^4 x)$ , the  $x$ -axis, and the vertical lines  $x = -\frac{2}{3}$  and  $x = \frac{2}{3}$ . The closest integer approximation of the area of  $R$  is

(A) 0      (B) 1      (C) 2      (D) 3      (E) 4

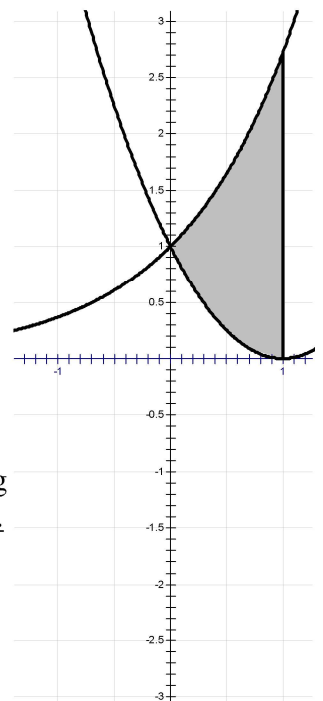
2. The base of a solid  $S$  is the region enclosed by the graph of  $y = \sqrt{\ln x}$ , the vertical line  $x = e$ , and the  $x$ -axis. If the cross sections of  $S$  perpendicular to the  $x$ -axis are squares, then the volume of  $S$  is

(A)  $\frac{1}{2}$       (B)  $\frac{2}{3}$       (C) 1      (D) 2      (E)  $\frac{1}{3}(e^3 - 1)$

3. Let  $R$  be the region enclosed by the graphs of  $y = e^x$ ,  $y = (x - 1)^2$ , and the vertical line  $x = 1$ .

a) Find the volume of the solid generated when  $R$  is revolved about the  $x$ -axis.

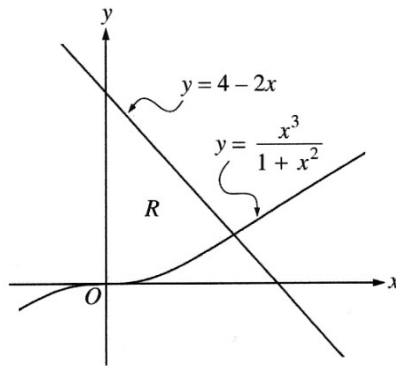
b) The base of a solid is the region  $R$ . Each cross section of the solid perpendicular to the  $x$ -axis is a semicircle. Write an expression involving one or more integrals that gives the volume of the solid. Do not evaluate.



Calculus BC -- Chapter 6 Sample Test (calculators allowed)

4. Let  $R$  be the region bounded by the graphs of  $y = e^x$  and  $y = -x^2 + 1$ .
- a) Find the area of  $R$ .

b) Write an expression involving one or more integrals that gives the length of the boundary of the region  $R$ . Do not evaluate.



5. Let  $R$  be the region bounded by the  $y$ -axis and the graphs of  $y = \frac{x^3}{1+x^2}$  and  $y = 4 - 2x$ , as shown in the figure above.

a) The region  $R$  is the base of a solid. For this solid, each cross section perpendicular to the  $x$ -axis is a square. Find the volume of this solid.

b) Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid generated when region  $R$  is revolved about the horizontal line  $y = -1$ .

Name \_\_\_\_\_

Period \_\_\_\_\_

Calculus BC – Chapter 6 Sample Test (no calculators)

Show all work for free-response questions.

1. The area of the region enclosed by the graph of  $y = x^2 + 1$  and the horizontal line  $y = 5$  is

- (A)  $\frac{14}{3}$       (B)  $\frac{16}{3}$       (C)  $\frac{28}{3}$       (D)  $\frac{32}{3}$       (E)  $8\pi$

2. Find the area of the region bounded by  $y = e^x$ ,  $y = e^{-x}$ , and the vertical line  $x = 1$ .

(A)  $e + \frac{1}{e} - 2$

(B)  $e - \frac{1}{e}$

(C)  $e + \frac{1}{e}$

(D)  $2e - 2$

3. Find the average value of  $f(x) = 1 - \frac{1}{1+x^2} + \sqrt{1-x^2}$  from  $x = -1$  to  $x = 1$ .

4. On a certain day, the temperature, in degrees Fahrenheit, in a small town  $t$  hours after midnight ( $t = 0$ ) is modeled by the function  $g(t) = 50 - 8 \sin\left(\frac{\pi t}{12}\right)$ . What is the average temperature of the town between 3am ( $t = 3$ ) and 6am ( $t = 6$ ), in degrees Fahrenheit?