Semester 2 - Unit 8 Review

AP Calc. AB/BC

1. The depth of the ocean just off the coast changes according the tides. The rate at which it is changing can be modeled by $R(t) = 2.12 \sin\left(\frac{\pi}{4}t\right)$, where $R(t)$ is feet per hour and t is hours after 9:00 a.m. If the depth of the ocean is 12 feet at this particular spot, how deep will it be at 11:00 a.m.?

2. Traffic flow measures the number of cars that pass through an intersection per minute. It can be modeled by the function $f(t) = 10 + 8\cos\left(\frac{t}{3}\right)$ for $0 \leq t \leq 15$ where $f(t)$ is measured in cars per minute and t is measured in minutes. Is the traffic flow increasing or decreasing at $t = 10$? Give a reason for your answer.

4. Let R be the region in the first quadrant bounded by the graphs of $y = \sqrt{x}$ and $y = \frac{x}{2}$.

   a. Find the area of R.

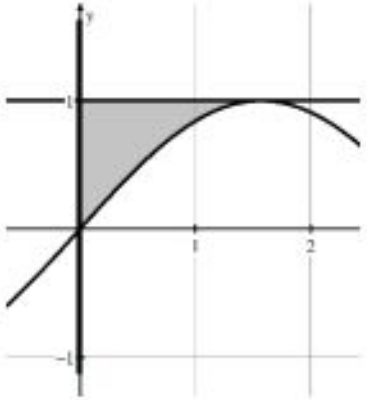
   b. Find the volume of the solid generated when R is rotated about the vertical line $x = -2$.

   c. The region R is the base of a solid. For this solid, the cross sections perpendicular to the y-axis are semicircles. Find the volume of this solid.

6. The area of the region in the first quadrant bounded by the graph of $f(x) = \frac{\ln x}{x}$ and the lines $x = 1$ and $x = e$ is

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

7. Setup integral(s) with respect to y that represent the area bounded by $y = \sin(x)$, $y = 1$, and $x = 0$. Do NOT evaluate.



8. Revolve the region bounded by the graphs of $y = x - 2$, $x = 4$, and $y = -1$ about the line $x = 4$. Set up the integral for the volume of this solid, but do NOT evaluate.

9. Revolve the region bounded by the graphs of $y = -x^2$ and $y = -1$ about the line $y = -1$. Set up the integral for the volume of this solid, but do NOT evaluate.

10. If the region enclosed by the y-axis, the curve $y = 4\sqrt{x}$, and the line $y = 8$ is revolved about the x-axis, the volume of the solid generated is

(A) $\frac{32\pi}{3}$ (B) 128π (C) $\frac{128}{3}$ (D) 128 (E) $\frac{128\pi}{3}$

14. The average value of the function $f(x) = (x-1)^2$ on the interval from $x = 1$ to $x = 5$ is

(A) $-\frac{16}{3}$ (B) $\frac{16}{3}$ (C) $\frac{64}{3}$ (D) $\frac{66}{3}$ (E) $\frac{256}{3}$

3. Find the distance traveled (to three decimal places) from $t = 1$ to $t = 5$ seconds, for a particle whose velocity is given by $v(t) = t + \ln t$.

(A) 6.000 (B) 1.609 (C) 16.047 (D) 0.800 (E) 148.413

11. Which of the following integrals gives the length of the curve $y = \sin x^2$ from $x = 0$ to $x = \frac{\pi}{5}$?

A. $\int_0^{\frac{\pi}{5}} \sqrt{1 + 2x \sin x^2}\, dx$

B. $\int_0^{\frac{\pi}{5}} \sqrt{1 + \sin^2(x^2)}\, dx$

C. $\int_0^{\frac{\pi}{5}} \sqrt{1 + 2x \cos x^2}\, dx$

D. $\int_0^{\frac{\pi}{5}} \sqrt{1 + 2x \cos^2(x^2)}\, dx$

E. $\int_0^{\frac{\pi}{5}} \sqrt{1 + 4x^2 \cos^2(x^2)}\, dx$

5. The table below gives the values of f', the derivative of f. If $f(4.2) = 3$, what is the approximation of $f(4.4)$ obtained by using Euler's method with 2 steps of equal size?

x	4.1	4.2	4.3	4.4
$f'(x)$	-0.2	-0.27	-0.32	-0.41

Answer Key:

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