
INSTRUCTIONS: Books, notes, and electronic devices are not permitted. Write (1) your name, (2) instructor's name, and (3) "**FALL 2009/TEST 1**" on the front of your bluebook. Also make a scoring table with room for 5 problems and a total score. **Work all problems. Start each problem on a new page. Clearly mark your answers.** A correct answer with incorrect or no supporting work may receive no credit, while an incorrect answer with relevant work may receive partial credit. **SHOW ALL WORK.**

1. (10 pts) Find the area of the surface generated by revolving $x = \sqrt{4y - y^2}$, $1 \leq y \leq 2$ about the y -axis.
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2. (20 pts)

- (a) Find the volume of the solid generated by revolving the region bounded by $y = \frac{4}{x^3}$, $x = 1$ and $y = 1/2$ about the line $x = 2$, using the *shell method*.
- (b) Set up but **do not solve** an integral (or integrals) to find the volume of the solid generated by revolving the region bounded by $y = 4/x^3$, $x = 1$ and $y = 1/2$ about the x -axis, using the *disk/washer method* (*Be sure to simplify the integrand.*)
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3. (30 pts)

- (a) Find the area of the region bounded by the curves $y = 2x^2$ and $y = 3 - x^2$.
- (b) Find the *centroid* of the thin plate bounded by $y = 2x^2$ and $y = 3 - x^2$.
(*Hint:* You may use the fact that the plate is symmetric about the y -axis.)
- (c) Set-up but **do not solve** an integral (or integrals) to calculate the perimeter of the region bounded by $y = 2x^2$ and $y = 3 - x^2$.
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4. (20 pts) Solve the differential equations (you may leave your answer in implicit form if necessary):

(a) $\sinh(x) \frac{dy}{dx} + 3 \cosh(x)y = \cosh(x) \sinh(x)$, $x > 0$ (b) $\sec(x)y' = e^{\sin(x)-y}$

5. (20 pts) Be sure to show all work and simplify your answer.

- (a) Find the derivative of $y = \sin^{-1}(x) - x \operatorname{sech}^{-1}(2x)$
- (b) Evaluate the integral $\int_{\pi}^{\sqrt{e}} \ln(\sinh(x) + \cosh(x)) dx$
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THERE ARE SOME USEFUL FORMULAS ON THE OTHER SIDE!
