

MAC 2312 Calculus II, Worksheet #4

Date: _____

Name: _____

For the problems 1-6, find the volume of the Solid using cylindrical shells (Shell Method) by:

- A) Sketching the Region
- B) Finding the limits, if need be
- C) Find the Surface Area of the generic (or Random) Shell
- D) Setting up the Integral for the volume of the Solid
- E) Solving the Integral.

Q1) $y = e^{-x^2}, y = 0, x = 0, x = 1$ about $y - axis$ Answer: $\pi(1 - \frac{1}{e})$

Q2) $y = 4x - x^2, y = x$ about $y - axis$ Answer: $\frac{27}{2}\pi$

Q3) $y = x^2, y = 6x - 2x^2$ about $y - axis$ Answer: 8π

Q4) $y = \sqrt{x}, x = 0, y = 2$ about $x - axis$ Answer: 8π (not a typo)

Q5) $x = 4y^2 - y^3, x = 0$ about $x - axis$ Answer: $\frac{512}{5}\pi$

Q6) $y = 4x - x^2, y = 3$ about $x = 1$. Answer: $\frac{8}{3}\pi$

Q7) Describe the Solid that is represented by the following Integral as the Volume:

A. $\int_0^3 2\pi x^5 dx$

B. $\int_0^1 2\pi(3 - y)(1 - y^2)dy.$

Q8) If the work required to stretch a spring 1ft beyond its natural length is 12ft-lb, how much work is needed to stretch 9in beyond its natural length? Answer: $6.75ft - lb$

Q9) Find the average value of the function $f(x) = 2\sin x - \sin(2x)$ on $[0, \pi]$. Using a computational tool find the c value(s) from Mean Value Theorem for Integrals if exists. Answer: $f_{ave} = \frac{4}{\pi}, c_1 \approx 1.238, c_2 \approx 2.808$

Q10) For the region $x = 2y - y^2, x = y$, just draw the graph and set up the integral of finding the volume of the solid (You do not have to solve it, though you are encouraged to do so)

- A. Revolve the region about $x - axis$
- B. Revolve the region about $y = 1$
- C. Revolve the region about $y = \frac{8}{5}$
- D. Revolve the region about $y = -\frac{2}{5}$.